METHOD AND APPARATUS FOR USING A TRANSACTION SYSTEM INVOLVING FUNGIBLE, EPHEMERAL COMMODITIES INCLUDING ELECTRICAL POWER

This application is related to Provisional Patent Application No. 60/158,603 docket number APXX0001PR, entitled "Reliable Distributed System and Market Engine", filed October 8, 1999; Provisional Patent Application No. 60/168,478 docket number APXX0002PR, entitled "Method and Apparatus of Managing Fungible, Ephemeral Commodities including Electrical Power", dated December 1, 1999; Provisional Patent Application No. 60/168,213 docket number APXX0003PR, entitled "Independent for Profit Power Exchanges and 'RTO Lite'", dated November 20, 1999; and Provisional Patent Application No. 60/206,852 docket number APXX0007PR, entitled "Macro Market Tools", dated May 23, 2000.

This application claims priority to Provisional Patent Application No. 60/291,218 docket number APXX0008PR, entitled "Web market Window", dated May 15, 2001.

This application is a Continuation-In-Part from Patent Application No. 09/564,415 docket number APXX0001, entitled "The Virtual Trading Floor for Trading Fungible, Ephemeral Commodities Including Electrical Power", filed May 2, 2000; Patent Application No. 09/613,685 docket number APXX0002 entitled "Method and Apparatus of Managing Fungible, Ephemeral Commodities including Electrical Power", filed July 11, 2000; Patent Application No. 09/542,854 docket number APXX0003, entitled "Method and System of Managing AC Power Networks Based upon Flow-Gate Market

Transactions", filed April 4, 2000; Patent Application No. PCT/US01/15,858 docket number APXX0004P, entitled "Method and Apparatus for an Engine System Supporting Transactions, Schedules and Settlements involving Fungible, Ephemeral Commodities including Electrical Power", filed May 16, 2001; Patent Application No. PCT/US01/16,886 docket number APXX0007, entitled "Method and System Supporting Trading of Fungible, Ephemeral Commodities Including Electrical Power", filed May 23, 2001.

Technical field

This invention relates to using a transaction system for trading, operational scheduling, and settling transactions involving ephemeral, fungible commodities with regards to electrical power as applied to grids of one or more AC power networks.

Background Art

The United States and, in particular, the state of California find themselves in a state of crisis regarding the availability and cost of electrical power. Many experts are investigating this crisis, including the inventors. Several primary problems contribute to that crisis.

1. The electrical power grid has seen almost no new electrical power generation capacity added in years.

2. Tools to optimally manage electrical consumption are antiquated and insensitive to changing consumption and cost patterns in real time, often amounting to no more than simple manual switches. While turning off unused equipment such as electric lights has been useful, it

does not help the facility managers who must make decisions based upon plans encompassing the facility needs, such as producing products to sell and providing hot water and comfortable room temperatures in hotels.

3. The system of transmitting electrical power, particularly AC electrical power has significant congestion paths, known herein as flow gates. There has been little economic incentive to increase the transmission capacity through the flow gates, in part because there is no coherent policy provided fair and predictable economic return to the required capital investments.

4. Deregulation in the California energy industry brought many things with it, including a restriction to only short-term energy contracts. As the older, long term contracts ended, this left the bulk of the state's energy costs vulnerable to daily market fluctuations and led to the prices on the spot market dominating the cost of energy not only in California, but throughout the United States.

Regarding adding electrical power generation capacity. Many large facilities are unwelcome in the neighborhoods where they may be built, due to pollution and a lack of esthetic appeal. Up until recently, this was cited as the primary reason for little new power capacity.

One promising alternative is power generation associated with an existing facility. Many facilities can produce large quantities of burnable fuel, which could be used to generate electricity. Such facilities include, but are not limited to, municipal waste treatment plants, commercial livestock farms

raising hogs and/or chickens, feed lots, saw mills, as well as farms raising vegetable matter, such as corn and sorghum. It is in the public interest that such facilities produce electrical power. Additionally, other facilities, including breweries, refineries and chemical plants, can produce electricity from steam, heated fluids or other gases, and/or heat already required by the facility.

These new facilities face must figure out how to manage such an endeavor without incurring a large management overhead. Today's power management procedures and technology is based upon large facilities, often generating hundreds of megawatts. Such facilities often require three shifts of operations staff, each of which may number a dozen or more people. These facilities also require energy traders, scheduling experts and an accounting staff to finalize and oversee the settlements phase. This management process is too expensive for a facility that sells power on the order of a megawatt. What is needed is a tool supporting all these management functions at a fraction of the overhead of contemporary methods.

Existing management systems for large generation facilities face a problem in reliably communicating between all these different necessary management functions. Usually the reliability error is in the interfaces between different management subsystems. What is needed is a unified mechanism supporting all the primary management activities discussed above, providing a consistent, easy to use tool for organizing the activities and communicating the results of the various managerial agents of a large generation facility.

As used herein, a fungible commodity refers to a commodity traded strictly in terms of the quantity of that commodity. No single unit of a fungible commodity is distinguishable from another unit of that commodity. A kilowatt-

hour of 60 Hz AC power delivered on a power line is not distinguishable from another kilowatt-hour delivered at the same time to the same place on the same line. An ephemeral, fungible commodity is a fungible commodity whose existence is extremely short-lived. Electrical power generation, network bandwidth, seats on an airplane and entry slots onto a freeway during rush hour are all examples of fungible commodities which exist but for a short duration of time. In contradistinction, starting lots in an assembly line produce tangible results, which may differ widely in content, thus showing an example of an ephemeral, non-fungible commodity.

There are some basic physical properties of electrical power distribution which are important to understand. An AC power network is an electrical network connecting AC power generators to AC power loads on power lines controlled so that the network as a whole can be seen to function at an essentially constant frequency and uniform phase across the network. Drifts in phase are compensated by phase shifting devices to enforce the uniform phase property across the AC power network. Drifts in frequency are compensated at the generators. Such frequency variations are typically caused by variances between the loads and generated power. The effect of these compensations is to operationally provide essentially constant frequency and uniform phase throughout the AC power network.

The AC power distribution frequency in the United States, Canada, Mexico and some other countries is 60 Hz and in some other countries is 50 Hz. In certain cases, the power is distributed in a 2-phase transmission scheme. In certain other instances, the power is distributed in a 3-phase transmission scheme.

A grid as used herein refers to an electrical power system which may comprise more than one AC power network as well as DC power lines which may transfer energy between nodes of different AC power networks or between nodes of a single AC power network.

Cities, generators and the like act as the nodes of an AC power network. A specific node may comprise more than one generator or load. A bus connects these local facilities of a node. High voltage AC transmission lines transfer power between the cities and the generators in major load centers of an AC power network.

By way of example, in the United States, there's an AC power network called the Western States Coordinating Council, which covers British Columbia in Canada down to Northern Mexico and over to the Rocky Mountains. There's another AC power network in Texas and there is another AC power network essentially covering the rest of the United States and Canada, with the exception of a portion of Quebec. These three AC power networks are connected together by direct current lines to form the North American grid. They are not connected in AC. They are asynchronous, in that they are not synchronized either in terms of frequency or phase across the United States, Canada and northern Mexico.

Electrical power generation can be readily seen to be ephemeral and fungible. One kilowatt is reasonably treated the same as another, persisting only a relatively short period of time. Electrical power transmission can also be seen as ephemeral and fungible. Electrical power transmission is most commonly performed as AC transmission lines between nodes of an AC power network.

DC power lines are used additionally to connect specific nodes of either a single AC power network or nodes of distinct AC power networks.

Electrical power storage is of typically limited time duration. The most commonly used storage system is to pump water uphill to a storage site where it is held until needed. When needed, it is gravity-fed through one or more turbines to generate electricity. Such systems, for economic reasons, are not used to store power for very long, often for no more than a day or two. It should be noted that the interface points for power into such systems are ephemeral and fungible.

Power switching between lines involving high power (megawatts and above) is not commonly done. Current examples of AC power switching include switching between amplifiers and antenna feeds in broadcast radio systems, and typically involve no more than a fraction of a megawatt. While there are some high power AC switches, they are large and expensive devices. High power AC switches rarely change state. Note that the power traversing the interfaces of such switches to a power network are ephemeral and fungible.

There are some basic physical properties distinguishing AC power distribution systems from other flow-based systems such as DC power, gas, water and oil transmission systems. AC power networks differ from gas, water, oil and other fluid flow distribution systems in that changes in power generation and loading propagate across such networks at approximately the speed of light. The effect of power generation and power loading effects the whole AC power network in a manner that, for practical purposes, is simultaneous.

Due to the stability of frequency and phase across an AC power network, changes in power have a super positioning effect. This insures that the power being carried on any line in the network is essentially a linear function of the generators and loads on the network. Furthermore, if a path of lines connects two nodes, generating power at the first node carried by the path is offset by power generated at the second node, as related by the above mentioned linear function.

These AC power networks are operated within a safe range, so that the patterns of flows are fairly predictable, given the configuration of the network does not change. The National Electric Reliability Council computes a system of a set of numbers called power transfer distribution factors available on the North American Reliability Council website, www.nerc.com, showing how the power is distributed across these various lines. It is a linear function of the amount injected, which changes sign when the direction of transfer changes from Node1 to Node2 into Node2 to Node1. Such functions are skew symmetric with respect to the nodes.

Consider a DC network: one can directly control the delivery of power from one point to another. This cannot be done on AC power networks. It is a characteristic of AC power networks that all lines are affected in roughly fixed proportions, sometimes referred to as "transfer distribution factors" and by the generating and loading at specific nodes.

By way of example, when AC power is sent from Bonneville Power Authority in the state of Washington to San Francisco, some of it comes down the direct path and some of it comes down through Idaho to Arizona and back up from Southern California to Northern California.

One may be limited in what can be brought from the Bonneville Power Authority to San Francisco because there's a problem with the flow coming up from Southern California to Northern California. Please note, this particular path, known as Path15, is often the first path to become congested.

These constrained flow elements are called flowgates. A flowgate of a given AC power network refers herein to a collection of at least one line whose total maximum safe carrying capacity acts as a congested element of the network, constraining AC power delivery between two or more nodes of that network.

Historical congestion analysis of specific AC power networks reveals that only a small number of flowgates account for almost all congestion problems. Such flowgates are herein referred to as significant flowgates. Path15 is considered a significant flowgate.

The associated AC power transfer across a given flowgate is additive due to the super positioning effects previously discussed. Thus, in sending 100 megawatts along a path, the transmission may have a 10% impact on the flowgate, putting 10 megawatts on the flowgate. A second generator may have a 5% impact on that flowgate. Generating 100 megawatt at the second generator would add 5 megawatt across the flowgate.

Figure **1A** depicts an exemplary AC power network based upon contemporary AC power technology as found in the prior art. The network contains 12 nodes labeled **10**, **20**, **30**, **40**, **50**, **60**, **70**, **80**, **90**, **100**, **110** and **120** respectively.

AC transmission line **12** runs between node **10** and node **20**. Line **14** runs between node **10** and node **40**. Line **22** runs between node **20** and node **30**.

Line **36** runs between node **30** and node **40**. Line **42** runs between node **40** and node **120**. Line **44** runs between node **40** and node **60**. Line **46** runs between node **40** and node **50**. Line **52** runs between node **50** and node **110**. Line **54** runs between node **50** and node **60**. Line **56** runs between node **50** and node **70**. Line **62** runs between node **60** and node **110**. Line **64** runs between node **60** and node **70**. Line **82** runs between node **80** and node **90**. Line **92** runs between node **90** and node **120**. Line **94** runs between node **90** and node **110**. Line **96** runs between node **90** and node **100**. Line **102** runs between node **100** and node **110**. Line **112** runs between node **110** and node **120**.

Flowgate A **210** is a constraint on the network. Lines **32**, **34** and **42** are constrained by flowgate A **210** by a total maximum safe carrying capacity, in that these lines have transmission capacity limitations which are easily overloaded when this maximum safe carrying capacity is exceeded.

Flowgate B **220** is a constraint on the network. Lines **42** and **44** are constrained by flowgate B **220**.

Flowgate C **230** is a constraint on the network. Lines **52** and **62** are constrained by flowgate C **230** to a total maximum safe carrying capacity.

By way of example, a mountain range such as the Cascade mountain range in the state of Washington might have a limited number of passes. The transmission lines through each mountain pass may form a single flowgate. Flowgates A **210**, B **220** and C **230** illustrate the overall effect that might result for transmission paths through three mountain passes.

Another problem, as yet addressed, is revenue sharing between multiple vendors supporting energy transmission along a flow path. By way of example, consider one of the few passes through the Cascade mountain range located in the state of Washington. Through each of these narrow corridors runs one or more strips of land populated by power transmission towers and high voltage power lines. The AC power transmitted on these power lines is frequency and phase matched. The collection of these AC power lines may create a single system constraint, a flowgate.

By way of example, suppose there are three transmission lines between two nodes in an AC power network, each individually capable of carrying 100 megawatts. These three transmission paths may collectively form a flowgate, which has a collective transmission limit of 200 megawatts, even though the sum of the three transmission lines is 300 megawatts.

Assume that some group of investors wants to finance a new set of towers supporting one or more transmission lines through this mountain pass. The new transmission facility will in all probability become part of the flowgate of transmission lines through that mountain pass from the moment it becomes operational. The question: How are flowgate transmission revenues to be shared when more than one group has made the capital investment to support such transmission? Note that if investors cannot reasonably predict a fair return on their investment, they will be unlikely to make the investment.

What is needed is a mechanism providing incentives to groups seeking to add transmission capabilities through fair and predictable revenue sharing from flowgate transmission revenues.

Figure **1B** depicts a list of associated AC power functions described by their coefficients for each flowgate of a collection of flowgates for each of the busses of the various nodes of the exemplary AC power network of Figure **1A** as disclosed in the prior art.

Note that these AC power functions are essentially linear and can be described by their coefficients.

Bus **1** locally connects all facilities of Node **10**. Bus **2** locally connects all facilities of Node **20**. Bus **3** locally connects all facilities of Node **30**. Bus **4** locally connects all facilities of Node **40**. Bus **5** locally connects all facilities of Node **50**. Bus **6** locally connects all facilities of Node **60**.

Bus **7** locally connects all facilities of Node **70**. Bus **8** locally connects all facilities of Node **80**. Bus **9** locally connects all facilities of Node **90**. Bus **10** locally connects all facilities of Node **100**. Bus **11** locally connects all facilities of Node **110**. Bus **12** locally connects all facilities of Node **120**.

Note that the facilities at these nodes, connected by the associated buss, often vary greatly in terms of generation capacity as well as loading capacity. By way of example, a city often consumes far more AC power than it generates. Another example, a node for a major hydroelectric dam such as Grand Coulee Dam would tend to generate far more AC power than it consumed.

Note that the associated AC power functions for the various busses are all fractions of 1, since the most power that could be transferred is the amount of power at the generation node. Note further that some of these AC power functions are negative. Bus **11** has strictly zeroes for its power function. It is

essentially acting as a reference node for calculating the associated functions. When electricity is generated at Bus **1** and consumed at Bus **11**, the values in the first row of Figure **2** indicate the ratio of power transferred across flowgates A, B, and C. If the power is generated at Bus **11** and consumed at Bus **1**, the same values apply but are of reversed sign.

Consider how AC power transfers are managed today in most of North Amerca. Transmission rights are considered and negotiated in terms of point-to-point transfers within the network known as contract paths. Such thinking is contrary to the previously discussed physics of these AC power networks, because changes in power generation or load at any node have an essentially linear effect on all transmission lines in the network, and consequently impact all flowgates within that network to some extent.

The contract path system maintains the fiction that AC power can be directed to follow a path through the network chosen as one might with natural gas. By changing the valves, one can mythically direct AC power a particular way through the AC power network. The contract path system was put in place because it was thought conceptually easier since one only had to make reservations along the single path. The fundamental problem with the contract path approach is that the contract path arrangement for transmission does not accord with the way the power actually flows in an AC power network.

Today's contract path is a first-come, first-served priority scheme. What is bought has very limited resale capability. By way of example, consider three nodes A, B and C forming a triangle in an AC power network. Suppose one bought a power transmission from A to B and bought a transmission from B to C. Using the contract path approach, does not mean one owns the power

transmission from A to C, because contract paths are not additive. Owning power transmission from A to B and from B to C would not entitle power transmission from A to C. To transport from A to C, one would have to purchase separately transmission from A to C. this is because there might be some flowgate constraint which would not be met in the two separate paths which would be triggered in the combined path. So in the contract based market, which is the traditional market, once you have purchased the transmission from A to B, it's only value is for moving energy from A to B.

Today, there are several ad hoc approaches to limiting flow on one path because of the impact on another path. These contract path approaches ignore the physics of AC power networks. This leads to situations where even though some other path may actually be the constraint, when a particular path becomes over-constrained, cuts are issued to compensate. The central operator acts, because a flowgate will attempt to exceed its safe carrying capacity, forbidding transmission often across apparently irrelevant paths to compensate. The result is market chaos, since participants do not have reasonable assurance that their deals will actually go to delivery.

Another alternative approach is to take all of these generator costs, and the preferences of the buyers, into a mathematical optimization program, and figure out the optimal flow. This alternative approach has significant disadvantages. In a commercial market, getting people to reveal all their costs is quite difficult. Most people are very reluctant to do that. Further, such costs frequently change. The loads have to reveal their preferences between consuming and non-consuming players, which is a tremendous informational burden. It is extremely unlikely that they could or would do it. Even if they

did, all this information is a tremendous burden on the central operator collecting all the information.

Such an alternative approach requires two-way communication among all the players, with all these devices and systems to control, when the people consume power and when they turn on and off these distributed devices. It has proven impossible to provide the requisite level of reliable communication and direct control systems. Besides, people are unwilling to turn over control of their business lives to a central operator.

Another approach in industry is used by a system operator called PJM, for Pennsylvania, New Jersey and Maryland, who have developed a system called Locational Marginal Pricing (LMP). It is a central dispatched methodology. However, a local flow model is buried within it. It supports some centralized management of generators, related equipment and facilities in order to get a consistent solution that is based upon the power distribution matrix. This is a matrix of all power transfer distribution factors between nodes of the AC power network.

This approach suffers from at least the same problems facing any other centralized control scheme. There is a very limited amount of detailed information such a system can acquire, or use, to optimize AC power transfers. The power users are again blind to their options. The players cannot determine what works best for them. The central operator dictates to them. This situation is not optimal. Also, under LMP, prices are not known until after the deal is done, which may be at the time of delivery or day ahead of delivery. Generation operators do not obtain the information they need to

plan their hydroelectric, maintenance, and unit commitment decisions. Nor can price risks be easily hedged.

NERC has developed a methodology addressing flowgates to some extent. This is discussed in a document entitled "Discussion Paper on Aligning Transmission Reservations and Energy Schedules to Actual Flows", distributed in November, 1998 by the NERC Transaction Reservation and Scheduling Self-Directed Work Team. This team proposed an electrical power industry shift to a system of reserving and scheduling transmission based on actual use of congested flowgates, which they called the FLOWBAT method. Their proposal suffers from a serious omission, it does not address the issue of allocating flowgate capacity when demand exceeds supply. By their silence on this issue, it appears that they would continue the current practice of first-come, first-served allocation. The flaws discussed above for centralized planning continue to be relevant in this approach.

Certain economists have expressed reservations with a flowgate market model utilizing a limited number of flowgates. They believe that leaving any flowgates out of the system, even minor ones, introduces gaming opportunities, which will cause the RTO to incur costs that must be paid by everyone. However, flowgates are numerous, and may arise unpredictably. It may not be feasible to trade every flowgate, as would be required to overcome the potential for gaming.

Supporting a large number of flowgates in a market model leads to several other problems. First, there is the technical problem of providing a user interface that makes it possible for users to cope with the complexity of numerous flowgates.

Second, there is the problem of maintaining liquidity with this many flowgates. Customers want to buy and sell the bundles of flowgates they need to move energy from one point in the network to another. They may not feel comfortable posting bids and offers for individual flowgates without an assurance that they will be able to buy or sell the remaining flowgates they need for their bundle at a reasonable price. If everyone withholds bids and offers from the market until they see bids and offers for all the flowgates they want to buy or sell, the market could significantly lack liquidity.

What is needed is a method of using a market model supporting large numbers of flowgates and providing users with a straightforward method of trading the AC power transfer, while discouraging gaming opportunities.

What is needed is a system supporting trading transmission rights and quantities of fungible ephemeral commodities in the form of complete bundles. These complete bundles would allow purchase of delivered energy with one transaction. The system should permit the bundles to be internally large and complicated, supporting trading in every flowgate right, and potential flowgate right and providing users with straightforward trading mechanisms for AC power transfer. Such trading mechanisms insure compliance with flowgate constraints, and thus the physics of AC power networks, while discouraging gaming opportunities.

LMP accomplishes this, but does so at a cost of forcing participants to trade FTRs at a limited number of discrete times. What is needed is an approach combining the flexibility of LMP with the benefits of true continuously traded forward markets.

While certain RTO's like the flowgate concept, they often do not want the responsibility for identifying a small number of commercially significant constraints. They want the market to identify the significant constraints.

To summarize, what is needed is a method of using a transaction system for electrical ephemeral, fungible commodities optimizing the trading, scheduling, congestion management, ancillary services, metering, billing and settlements of accounts for electrical grids. Such a system and the methods of its use should support the needs of coordinating the management of a large enterprise as well as encourage the entry of small facility operators into the power generation, transmission business, as well as aid consumption management by electrical power consumers.

Summary of the invention

The presently preferred embodiment of the invention fulfills at least the requirements and needs discussed with regards to the prior art. The invention includes methods and apparatus support the certified client initiating at least one action in the transaction system; as well as use of at least two of the following: Managing a user resource collection; Managing a bilateral trading portfolio; Managing a market position portfolio; Managing a market trading collection; Managing a credit resource collection; And managing compliance reporting based upon at least one of the collection comprising the user resource collection, the market position portfolio, the bilateral trading portfolio, and the market trading collection.

The market trading collection is comprised of at least one market trade. A market trade involves a market interval with a product type, location and time

interval, as well as at least an amount and a price. A market trade may be either an ask and/or a bid and/or a commitment regarding the market interval, amount and price.

The market position portfolio is comprised of at least one market position summary for at least one market interval, which summarizes open bids and asks for that market interval. The market position portfolio may include market position summaries for market intervals that differ in at least one of the following: product type, location and/or at least one time interval. Presentation of the market position summary may include the summary of bid and ask prices and amounts, as well as presentation of product type, location and time interval(s). When the certified client is a trader, it preferably supports simultaneous presentation of the market position summary and trading position for at least one market interval.

Note that the apparatus may include, but is not limited to, one or more computers implementing the methods as program systems, as well as mechanisms which lack program pointers, thus program steps.

The invention advantageously provides for greater integration of management tasks, thereby reducing potential errors encountered at interfaces between various tools individually performing these tasks.

The invention further advantageously provides a uniform user interface to aid operators in the extremely complex task of trading fungible, ephemeral commodities, including, but not limited to, DC and AC electricity, AC power transfers, flowgate rights, and point-to-point AC power transfer rights with bundled flowgate transmission rights.

The invention advantageously provides a seamless integration from trading, through scheduling and into operational control of the equipment found in an AC power network, or more generally, in a grid containing at least one AC power networks. Such embodiments offer cost efficient management systems to existing, as well as potential, energy consumers, energy producers, and transmission operators.

Brief Description of the Drawings

Figure **1A** depicts an exemplary AC power network based upon contemporary AC power technology as found in the prior art;

Figure **1B** depicts a list of associated AC power functions described by their coefficients for each flowgate of a collection of flowgates for each of the busses of the various nodes of the exemplary AC power network of Figure **1A** as disclosed in the prior art;

Figure **2A** depicts various certified clients, **3100**, **3120**, **3140**, and **3160-3180**, controlling a means for using **5000** a transaction system **6000**;

Figure **2B** depicts a simplified block diagram in which the mean **5000** for using means supporting transaction system **6000** includes a transaction system **3000** comprised of at least one computer communicatively coupled with the certified client(s) and controlled by program system(s) made up of program steps residing in accessibly coupled **3022** memory **3026**;

Figure **2C** depicts a refinement of transaction system **3000** as a system diagram in Figure **2B**;

Figure **2D** depicts a refinement of transaction system **3000** as a system diagram in Figure **2C**;

Figure **2E** depicts a grid management system providing functions and services for grid market operations including a collection of client computers **3700**, **3720**, **3740**, **3760** and **3780** respectively coupled through network **3200** to server system **3500** including server computer **3520**, and web server computer **3560**, as well as server computer **3580** and database engine **3590**;

Figure **2E** depicts a collection of client computers **3700**, **3720**, **3740**, **3760** and **3780** respectively coupled through network **3200**, as depicted in Figure **2E**, with further refinements showing a program system **4000** supporting communicating with one or more members of the engine system, as well as encryption devices;

Figure **3A** depicts a virtual trading floor **1000**, containing validated orders and market intervals with associated market states and further containing a certified client collection of certified clients;

Figure **3B** depicts a market interval containing a product type, location and time interval;

Figure **3C** depicts a refinement of a market interval as depicted in Figure **3B** further containing multiple time intervals;

Figure **3D** depicts a macro market interval **1500** for a fungible, ephemeral commodity from Figure **3A**;

Figure **4** depicts a detail flowchart of operation **5000** of Figure **2A-2E** for method of a certified client interactively using a transaction system supporting transactions involving at least one fungible, ephemeral commodity;

Figure **5A** depicts a detail flowchart of operation **5012** of Figure **4** for the certified client initiating the action in the transaction system;

Figure **5B** depicts a detail flowchart of operation **5212** of Figure **5A** for the certified client responding to the financial commitment presented by the transaction system;

Figure **6A** depicts a validated order **1200** of the validated order collection;

Figure **6B** depicts a refinement of Figure **6A** of a validated order **1200** of the validated order collection;

Figure **7A** depicts a refinement of Figure **3B** of a market interval of an energy product type;

Figure **7B** depicts a refinement of Figure **3B** of a market interval of an AC power transfer product type;

Figure **7C** depicts a refinement of Figure **7B** of a market interval of an AC power transfer product type;

Figure **7D** depicts a refinement of Figures **7B** and **7C** of a market interval of an AC power transfer point-to-point product type;

Figure **8** depicts a validated order **1200** comprised of at least two validated orders, each with an associated market interval;

Figure **9A** depicts a market interval of a DC power line;

Figure **9B** depicts market interval **1100** of Figure **3B** further containing a window time interval during which the market interval is active only within the window time interval;

Figure **9C** depicts market interval **1100** of Figure **9B** containing a window time interval and multiple time intervals;

Figure **10** depicts a view of certified client user interface **7000** showing an ordering screen with hourly time interval based market intervals for a specific energy market;

Figure **11** depicts a view of certified client user interface **7100** showing an ordering screen for daily on-peak time interval based market intervals for a specific energy market;

Figure **12** depicts a view of certified client user interface **7200** showing an ordering screen for hourly time interval based market intervals for a specific flowgate market;

Figure **13** depicts a view of certified client user interface **7300** showing an ordering screen for hourly time interval based market intervals with respect to a specific facility ("Hyatt Generation") including energy transmission costs from multiple displayed markets;

Figure **14** depicts a view of certified client user interface **7400** showing an ordering screen for hourly time interval based market intervals from a trade book perspective;

Figure **15** depicts a view of certified client user interface **7500** showing an overview trading position for specific hours of two successive days including the trade book and a limited number of certified clients;

Figure **16** depicts a detailed view of certified client user interface **7600** showing the trading position for specific hours of two successive days with regards to one certified client based upon Figure **15**;

Figure **17** depicts a view of certified client user interface **7700** providing an overview of the reports on transactions and/or schedules available for presentation to the user;

Figure **18** depicts a view of certified client user interface **7800** providing a detailed view of the monthly invoice for the certified client including fees to the transaction engine service provider, who may be a first party, (APX Fees **7802**);

Figure **19** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource;

Figure **20A** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource;

Figure **20B** depicts a detail flowchart of operation **5452** of Figure **20A** for creating the first knowledge interval;

Figure **21A** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource;

Figure **21B** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource;

Figure **21C** depicts a detail flowchart of operation **5192** of Figure **5A** for the certified client initiating the bid;

Figure **22** depicts a detail flowchart of operation **5592** of Figure **21A** for operating the equipment usage item;

Figure **23A** depicts a detail flowchart of operation **5042** of Figure **4** for managing the market position portfolio;

Figure **23B** depicts a detail flowchart of operation **5732** of Figure **23A** for presenting the local market position portfolio;

Figure **24** depicts a detail flowchart of operation **5752** of Figure **23B** for presenting the market position summary;

Figure **25A** depicts a detail flowchart of operation **5000** of Figure **4** for the method of using the transaction system;

Figure **25B** depicts a detail flowchart of operation **5832** of Figure **25A** for maintaining the market position database;

Figure **26** depicts a detail flowchart of operation **5852** of Figure **25B** for maintaining the market position;

Figure **27A** depicts a detail flowchart of operation **5042** of Figure **4** for maintaining the local market position portfolio;

Figure **27B** depicts a detail flowchart of operation **5000** of Figure **2A-2E** for the method of using the transaction system;

Figure **28A** depicts a detail flowchart of operation **5000** of Figure **2A-2E** for the method of using the transaction system;

Figure **28B** depicts a detail flowchart of operation **5872** of Figure **26** for maintaining the current bid list;

Figure **29** depicts a detail flowchart of operation **5032** of Figure **4** for managing the bilateral trading portfolio;

Figure **30A** depicts a detail flowchart of operation **5032** of Figure **4** for managing the bilateral trading portfolio;

Figure **30B** depicts a detail flowchart of operation **5062** of Figure **4** for managing the credit resource collection, for each of the credit resources of the credit resource collection;

Figure **31** depicts a detail flowchart of operation **8152** of Figure **30B** for managing the credit resource, for at least one of the credit resources of the credit resource collection;

Figure **32A** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource;

Figure **32B** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource;

Figure **33A** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource;

Figure **33B** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource;

Figure **34A** depicts a detail flowchart of operation **5052** of Figure **4** for managing said market trade collection; and

Figure **34B** depicts a detail flowchart of operation **8412** of Figure **34A** for presenting said market trade, for at least one of said market trades.

Detailed Description of the Invention

Note that a commitment may be performed without requiring a schedule. For example, a first certified client may buy a certain amount of green tickets, e.g. a form of tradable ecology-based energy credit, from a second certified client. In such situations, there might be no schedule generated for that commitment, but each certified client involved in the commitment would find the commitment referenced in the settlement.

A commitment may be scheduled for performance, but not actually be performed. For example, a network operator may curtail the availability of electrical power to consumers in certain areas to avert a blackout. Those consumers, while having scheduled commitments, did not fully enjoy the performance of the commitments. While the schedule would reflect the commitment, the settlements for those consumers would reference the actual performance of that commitment.

Figure **2A** depicts various certified clients, **3100**, **3120**, **3140**, and **3160-3180**, controlling a means for using **5000** a transaction system **6000**.

The certified client may control **3102**, **3122**, **3142** and **3182** the means of use **5000** acoustically and/or tactilely and/or via wireless communications and/or via wireline communications the transaction system **6000**.

Means for using **5000** and/or transaction system **6000** may include implementations of the respective operational methods, which do not rely upon instruction pointers and as such may not be considered as computers in a traditional sense.

Note that these entities, the human being **3100**, corporate entity **3120**, agent **3140** and software agent **3160** may communicate with means **5000** by use of messages as represented by arrows **3102**, **3122**, **3142**, and **3182**, respectively. Such messages may use a wireline physical transport layer as represented by one or more of the arrows **3102**, **3122**, **3142**, and **3182**. Such messages may use a wireless physical transport layer as represented by one or more of the arrows **3102**, **3122**, **3142**, and **3182**. Such messages may use body signals in certain further embodiments of the invention. Such messages may further use hand signals. Such message may also use acoustic signaling of messages. Such messages may also further use verbal messages in a human language.

Figure **2B** depicts a simplified block diagram in which the mean **5000** for using means supporting transaction system **6000** includes a transaction system **3000** comprised of at least one computer communicatively coupled with the certified client(s) and controlled by program system(s) made up of program steps residing in accessibly coupled **3022** memory **3026**.

The operational methods **5000** and **6000** are respectively supported by program systems **5000** and **6000** containing program steps residing in memory **3026** accessibly coupled **3022** to at least one computer **3020** in the transaction system.

The transaction system may further comprise a client computer communicatively coupled to a server computer included in a server system. The certified client may operate the client computer to interactively use the transaction system.

The server system may provide a market engine supporting a virtual trading floor involving at least one of the fungible, ephemeral commodities. The server system may further comprise an engine system supporting the virtual trading floor involving the fungible, ephemeral commodities.

Transaction system **3000** is comprised of at least one computer **3020** coupled **3024** to computer readable memory **3026**. The communication and interaction between transaction system **3000** and computer **3020** is denoted by arrow **3022**. Such communication and interaction **3022** may employ a variety of communications technologies, including a wireless physical transport layer in certain embodiments of the invention. Alternatively, communication and interaction **3022** may employ a wireline physical transport layer.

Note that the invention may include only a market engine of the invention supporting at least any two of the following: a virtual trading floor **6032**, bilateral trading **6042** and/or external market trading **6052**, as well as maintain the commitment list **6062**.

Figure **2C** depicts a refinement of transaction system **3000** as a system diagram in Figure **2B**. This transaction system is comprised of a client computer collection and a server system **3500** coupled to a network **3200**.

The client computer collection is comprised of at least one client computer **3600** operated (used) **3192** by certified client **1400**. Client computer **3610** may be operated (used) **3104** by a human being as client **3100**. Client computer **3620** may be operated (used) **3124** by a corporate entity as client **3120**. Client computer **3630** may be operated (used) **3144** by an authorized agent as client **3140**. The certified client may be represented by an agent, authorized by the first party, to act on behalf of the first party with respect to contracting.

Server system **3500** includes at least one server computer **3520** coupled to network **3200**. Network **3200** further couples **3602**, **3612**, **3622**, **3632** and **3642** to client computers **3600**, **3610**, **3620**, **3630** and **3640**, respectively. Network **3200** at least supports communication between client computers and at least one server computer **3520** of server system **3500**. As used herein, the term network refers not only to Local Area Networks (LANs), but also to Wide Area Networks (WANs). Network supported communication as used herein includes, but is not limited to, digital communication protocols as well as analog communication protocols. Network supported communication as used herein further includes, but is not limited to, message passing protocols and packet based protocols. Network supported communication as used herein further includes, but is not limited to, communication protocols including TCP/IP. Network supported communication as used herein further includes, but is not limited to, communication protocols supporting the Internet. Network supported communication as used herein further includes, but is not limited to, communication protocols supporting the World Wide Web.

Client computer **3610** with coupled **3614** computer readable memory **3616** may be operated **3104** by a client **1400** further coupled **3194** to computer readable memory **3606**. Memory **3616** is shown containing program system **5000** and program system **4000**. Program system **4000** implements a method of operating the client computer with respect to the transaction system, including the server and/or server system as illustrated in Figures **2C** to **2E**. Due to space constraints in Figures **2C** to **2E**, program system **4000** is only explicitly shown here. This is not means to limit the scope of the Claims, but is done strictly for the purpose of clarifying the discussion and drawings.

Client computer **3640** with coupled **3644** computer readable memory **3646** may be operated **3164** by a software agent as client **3160**. The coupling **3194** may provide various personal optimizations and shortcuts, including, but not limited to, macro style functions and standard contract forms employed by the client **1400**.

Server system **3500** may include at least one server computer **3520** coupled **3524** to computer readable memory **3526**.

Figure **2D** depicts a refinement of transaction system **3000** as a system diagram in Figure **2C**. This transaction system is comprised of a client computer collection and a server system **3500** coupled to a network **3200**.

Server system **3500** may include at least one server computer **3520** coupled **3524** to computer readable memory **3526**.

Note that server computer coupled computer readable memory may contain a read-write accessible memory. Note that the read-write accessible memory may contain at least one mass storage unit. In certain a mass storage unit

may include a disk drive. A mass storage unit may be accessed using a file management system. A mass storage unit may be accessed as a database.

The invention also comprises a method of operating a client computer with a client computer message address interfaced with a reliable distributed system composed of a server system containing server computers with associated messaging addresses. The method includes a login procedure, a message composition procedure for an outgoing message to the reliable distributed system, and a message analysis procedure for an incoming message from the reliable distributed system.

The login procedure may maintain a list of messaging addresses of the collection of computers of the distributed system, a first login message and a login protocol and performs the following:

a. A first server computer of the server system is selected, and a first login message is sent to the associated address of the first server computer.

b. If there is a first acknowledgment message received from the first server computer message address then the login procedure proceeds to perform the login protocol.

c. Whenever the login protocol fails with the first server computer or

- whenever there is no acknowledgment message received from the first server computer within a predetermined amount of time or
- whenever there remain server computers in the server system for which login has not been attempted,
- a new first server computer is selected from the remaining server computers of the server system and these steps are repeated.

d. Whenever the login protocol succeeds with the first server computer, the first server computer is designated the connection computer.

The message composition procedure for an outgoing message to the distributed system may comprise performing the following: Maintaining a list of message formats. Determining the selection of a first message format. Using the first message format to create an outbound message. Sending the outbound message to the connection computer.

The message analysis procedure for an incoming message from the distributed system may comprise performing the following: Receiving the message from the connection computer. Validating the received message creates a valid received message.

An object class structure may be used to support message passing, each message comprising a message type and at least one message field. Each message-passing object comprises handling an unknown message type and handling for an unknown message field.

Handling an unknown message type for a received message from a first object by a second object may comprise the first object sending the second object a reply message indicating unknown received message type and referencing the received message.

Handling an unknown message field of the received message by the second object may comprise handling the other fields of the received message by the second object.

The invention may operate a reliable distributed system of a collection containing at least one process group running on several computers comprising receiving confirmed messages from certified clients and maintaining a group state. Each process group computer possesses a messaging address. The computers of a process group communicate among themselves with a virtually synchronous messaging system.

Receiving a confirmed message from a certified client may occur at one computer of the first collection of computers running the process group. Upon receipt the receiving computer broadcasts the confirmed message from the certified client to all computers of the first collection of computers.

Maintaining a group state on each computer of the first collection of computers of the process group may comprise the following operations: Each computer processes the confirmed message from the certified client to create a group state candidate. Each computer broadcasts a virtually synchronous group state candidate message to the other computers. Each computer receives the virtually synchronous group state candidate messages of the other computers. Each computer analyzes the received virtually synchronous group state candidate messages and its own virtually synchronous group state candidate to create a new group state.

Reliable distributed computer systems have been developed in the prior art, as in Reliable Distributed Computing With the Isis Toolkit, edited by Birman and Van Renesse, ISBN 0-8186-5342-6, © 1994 Institute for Electrical and Electronic Engineers, Inc. These reliable distributed systems are based around process groups of cooperating concurrent processes redundantly

performing the same operations on copies of the same data while being distributed through a multi-computer system.

The prior art (particularly in Chapter 11, "Reliable Communication in the Presence of Failures" pages 176-200, in Reliable Distributed Computing With the Isis Toolkit) discloses basic communication protocols, ABCAST and GBCAST, for broadcasting messages within a process group and for detecting and reacting to network failures. The protocols provide strong guarantees for message delivery causality and message delivery atomicity. Message delivery causality is the guarantee that a message should not be delivered before its predecessor. Message delivery atomicity guarantees that two messages are delivered in the same sequence to all recipients.

The invention may employ a messaging system for message passing concurrent objects, instances of which reside on computers each possessing a controller belonging to a collection of computers comprising ABCAST protocol and GBCAST protocol. The ABCAST protocol is an atomic broadcast protocol used to communicate messages between object instances across the computers of the collection of computers. The GBCAST protocol is a global broadcast protocol to communicate messages between controllers of the computers of the collection of computers.

The invention may employ an object class structure executing in a process group of computers communicating with each other via a messaging protocol supporting at least virtual synchrony. Each instance of each object of the object class structure comprises an object instance clone reading on each of the process group computers.

Each object instance may further send and receive messages from other object instances and each object instance clone communicates with messages to other object instance clones of the same object instance.

However, the ABCAST and GBCAST protocols are not sufficient by themselves to implement a message driven architecture. A message driven architecture requires that objects can not only send message to each other, but also reply to those messages. The R-Object class, as used herein, refers to an object class supporting at least ABCAST, GBCAST and a message driven architecture.

Each object class may further possess a state, which is a member of a collection of states. Each instance of each object class state changes as an atomic event. All activities of each object class occur as atomic events. Atomic events may be triggered by message reception. Each instance of an object receives messages triggering state changes in the same sequence as all other instances of that object. This enforces all R-Object instances changing their state through exactly the same sequence without having to directly communicate that new state among themselves.

A concurrent computing entity may reside on each of the computers of a process group of computers where it owns access to a binary file or memory used for storing the resilient object instance state. It executes updates to the binary file as a transaction. The storage in the binary file is organized into table objects. Each table object consists of a set of records.

In certain embodiments of the invention, all individuals wishing to access the RTO systems must establish a login session with the appropriate system.

This applies to RTO participants, RTO staff, as well as other systems that are integrated into the platform. Each login session is established under the protocols of the security integrated into the RTO systems. The location of the session may not be important to the system, allowing the RTO to operate multiple sites. The multiple RTO sites may each operate as a monitor site, a failover site, or to share workload. Login session at multiple sites can be connected to server system **3500** simultaneously, and are synchronized by server system **3500**.

Each RTO participant may share the same security information for authorized scheduling entities (ASEs), RTO operators, and transmission operators (TOs). This security information may be maintained through the registration interface, through which all permissions for each participant may be maintained. This information may be used to validate all login sessions.

Access to the server system **3500** and/or server computer **3560** may be obtained by establishing a login session with the appropriate system. This may apply to RTO participants, including ASEs, RTO operators, and TOs, as well as other computer systems, such as EMS/SCADA systems. This ensures that only authorized individuals and systems can access the APX systems.

The security information may be checked each time that an RTO participant or computer system attempts to log into server system **3500** or server computer **3520** or web server **3560**. Login information may include a login ID and password. Login information may be passed in an encrypted form. If access is permitted, the login session may then be configured in accordance with the permissions associated with the particular login ID.

This ensures that each RTO participant may access only those systems and data to which the participant is authorized.

Access to each system may also be controlled in terms of modes including at least receiving data, placing bids, and viewing positions. This mechanism restricts each login session to its authorized systems, making available only its authorized information, and does so in only its authorized modes.

Each login session may include a real-time, two-way communication session or a secure web-based connection between the RTO participant software and the servers. Each session may rely on one or more encryption mechanisms to encode the communication. For the real-time connections, this mechanism may include frequent encryption key change, which may further be invisible to the user to ensure privacy of communication between each RTO participant and the systems **3500** and **3560**.

The invention may include help desk staff. The help desk staff may not have access to market data, scheduling data, or any participant business data. Further, the help desk staff may be unable observe A/S auction or EIS market activity. The help desk staff may not know who or what was selected or dispatched, or at what price. The help desk staff may in certain embodiments only monitor system conditions, such as the number of sessions logged on, the level of activity in the market (for performance monitoring), and when bidding is opened or closed. The help desk staff may maintain reliable data archives and backups on all servers. The help desk staff may perform these maintenance and archival tasks without regard to content.

In certain embodiments, certified users are primarily approved scheduling entities (ASEs), the control area operators (CAOs), and the RTO operators (regardless of location). These certified users may participate in the RTO at the operational level, using services of the server system **3500** or web server **3560**.

The invention may include a method of operating a client computer communicatively coupled to an engine system. The engine system includes at least one of the following: a market engine, a scheduling engine and a settlement engine. The client computer communicating with the engine system supports certified client transactions regarding market intervals. Each market interval contains at least one fungible, ephemeral commodity, a location and a time interval.

An engine group includes at least two engine group computers, each implementing a market engine, a scheduling engine or a settlement engine. Note that two engine group computers may redundantly implement a market engine. Alternatively, two engine group computers may redundantly implement a scheduling engine. Additionally, two engine group computers may redundantly implement a settlement engine. An engine group may include two engine group computers implementing different engines. The engine group provides multiple access mechanisms by which communications between the client computer and the engine system may take place.

Note that the engine system may include one or more engine groups. Note that the engine system may be implemented as an engine group.

The client computer may interact with at least one member of the engine group by establishing the client computer as the certified client through communication with the engine system and participating as the certified client communicating with the engine system.

The engine group advantageously removes the potential for a single point of failure in the communication between the client and the engines implemented by the engine group, increasing the overall communication system reliability.

Figure **2E** depicts a grid management system providing functions and services for grid market operations including a collection of client computers **3700**, **3720**, **3740**, **3760** and **3780** respectively coupled through network **3200** to server system **3500** including server computer **3520**, and web server computer **3560**, as well as server computer **3580** and database engine **3590**.

The discussion of variations regarding the use of client computers is found in Figures **2C** and **2D**. A certified client, possibly a human being, corporate entity, agent, or software agent may each control any of the examples of client computers **3700**, **3720**, **3740**, **3760** and **3780**.

As used herein, MOPI refers to Market Operations Participant Interface. MOPI is an interface may that include, but is not limited to, the functions and capabilities of Participants, who are certified clients of the system.

As used herein, RTOI refers to RTO Operator Interface. RTOI is an interface that may include, but is not limited to, the functions and capabilities of Participants, who are certified clients of the system and who interact as RTO Operators within one or more grids.

As used herein, EMS refers to Energy Management System.

EMS and RTOI components may each further perform operations including, but not limited to,

- Receiving energy management schedules,
- Confirming receipt of energy management schedules,
- Receiving requests for energy equipment status,
- Providing energy equipment status,
- Sending requests for energy equipment status,
- Receiving energy equipment status reports,
- Receiving metering data about transmission lines,
- Receiving frequency data about transmission lines, and
- Command override messages putting a specific remote energy site off-limits to automated control and places it under manual control of the operator.
- Sending output adjustment commands to remote energy generation sites.

Note that these output adjustment commands have the effect of modifying the transmission line frequencies and the output adjustment commands take into account the effect on transmission line frequencies as well as flowgate constraints in making these commands.

There may be client computers with accessible memory containing MOPI components such as client computers **3700** and **3720** or containing RTOI components such as client computers **3740** and **3760** or containing EMS components such as client computer **3780**. There may be no client computers with accessible memory containing MOPI components such as client computers **3700** and **3720**. There may be no client computers with accessible memory containing RTOI components such as client computers **3740** and **3760**. There may be no client computers with accessible memory containing EMS components such as client computer **3780**.

Client computer **3700** accessibly couples **3704** to computer readable memory **3706** as well as communicatively couples **3702** to network **3200**. The MOPI realtime component **3710** and MOPI dynamic and static component **3712** may both reside in accessibly coupled memory **3706**.

The MOPI realtime component **3710** may include a method of using market engine **3810** with MOPI dynamic and static component **3712**. The method of using market engine **3810** may include, but is not limited to, participating in sessions with market engine **3810** in which at least one of the following may occur. An order may be sent, which may include one or more ask orders and/or one or more bid orders. A market price may be requested. A market price may be received. A validated commitment may be received. Notification of the opening or closing of a market interval may be received.

The MOPI realtime component **3710** may include the ability to use communication with more than one server computer **3520** within server system **3500** to communicate within a session with the market engine **3810**.

The MOPI realtime component **3710** may include the ability to encrypt the communication with server system **3500**. Alternatively, the client computer **3700** may include security devices insuring security independently of the method of using the market engine. Additionally both the MOPI realtime component **3710** and the client computer **3700** may act together to provide two layers of security.

Client computer **3720** accessibly couples **3724** to computer readable memory **3726** as well as communicatively couples **3722** to network **3200**. The MOPI software component **3730** and MOPI dynamic and static component **3732** may both reside in accessibly coupled memory **3726**.

The MOPI realtime component **3730** may include a method of using market engine **3810** with MOPI dynamic and static component **3712**. The method of using market engine **3810** may include, but is not limited to, participating in sessions with market engine **3810** in which at least one of the following may occur. An order may be sent, which may include one or more ask orders and/or one or more bid orders. A market price may be requested. A market price may be received. A validated commitment may be received. Notification of the opening or closing of a market interval may be received.

The MOPI realtime component **3730** may include the ability to use communication with more than one server computer **3520** within server system **3500** to communicate within a session with the market engine **3810**. MOPI realtime component **3730** may further include API **3734**, which controls the ability to use communication with more than one server computer **3520** within server system **3500** to communicate within a session with the market engine **3810**.

The MOPI realtime component **3730** may include the ability to encrypt the communication with server system **3500**. Alternatively, the client computer **3720** may include security devices insuring security independently of the method of using the market engine. Additionally both the MOPI realtime component **3730** and the client computer **3720** may act together to provide two layers of security. MOPI realtime component **3730** may include security module **3736** providing the ability to encrypt the communication with server system **3500**.

Client computer **3740** accessibly couples **3744** to computer readable memory **3746** as well as communicatively couples **3742** to network **3200**. The RTOI software component **3750** and RTOI dynamic and static component **3752** may both reside in accessibly coupled memory **3746**.

The RTOI realtime component **3750** may include a method of using market engine **3810** with RTOI dynamic and static component **3712**. The method of using market engine **3810** may include, but is not limited to, participating in sessions with market engine **3810** in which at least one of the following may occur. An order may be sent, which may include one or more ask orders and/or one or more bid orders. A market price may be requested. A market price may be received. A validated commitment may be received. Notification of the opening or closing of a market interval may be received.

The RTOI realtime component **3750** may include the ability to use communication with more than one server computer **3520** within server system **3500** to communicate within a session with the market engine **3810**. RTOI realtime component **3750** may further include API **3754**, which controls the ability to use communication with more than one server computer **3520**

within server system **3500** to communicate within a session with the market engine **3810**.

The RTOI realtime component **3750** may include the ability to encrypt the communication with server system **3500**. Alternatively, the client computer **3740** may include security devices insuring security independently of the method of using the market engine. Additionally both the RTOI realtime component **3750** and the client computer **3740** may act together to provide two layers of security. RTOI realtime component **3750** may include security module **3756** providing the ability to encrypt the communication with server system **3500**.

Client computer **3760** accessibly couples **3764** to computer readable memory **3766** as well as communicatively couples **3762** to network **3200**. The RTOI software component **3770** and RTOI dynamic and static component **3772** may both reside in accessibly coupled memory **3766**.

The RTOI realtime component **3770** may include a method of using market engine **3810** with RTOI dynamic and static component **3712**. The method of using market engine **3810** may include, but is not limited to, participating in sessions with market engine **3810** in which at least one of the following may occur. An order may be sent, which may include one or more ask orders and/or one or more bid orders. A market price may be requested. A market price may be received. A validated commitment may be received. Notification of the opening or closing of a market interval may be received.

The RTOI realtime component **3770** may include the ability to use communication with more than one server computer **3520** within server

system **3500** to communicate within a session with the market engine **3810**. RTOI realtime component **3770** may further include API **3774**, which controls the ability to use communication with more than one server computer **3520** within server system **3500** to communicate within a session with the market engine **3810**.

The RTOI realtime component **3770** may include the ability to encrypt the communication with server system **3500**. Alternatively, the client computer **3760** may include security devices insuring security independently of the method of using the market engine. Additionally both the RTOI realtime component **3770** and the client computer **3760** may act together to provide two layers of security. RTOI realtime component **3770** may include security module **3776** providing the ability to encrypt the communication with server system **3500**.

Client computer **3780** accessibly couples **3784** to computer readable memory **3786** as well as communicatively couples **3782** to network **3200**. The EMS realtime component **3790** may both reside in accessibly coupled memory **3706**.

The EMS realtime component **3790** may include a method of using market engine **3810** with EMS dynamic and static component **3712**. The method of using market engine **3810** may include, but is not limited to, participating in sessions with market engine **3810** in which at least one of the following may occur. An order may be sent, which may include one or more ask orders and/or one or more bid orders. A market price may be requested. A market price may be received. A validated commitment may be received. Notification of the opening or closing of a market interval may be received.

The EMS realtime component **3790** may include the ability to use communication with more than one server computer **3520** within server system **3500** to communicate within a session with the market engine **3810**. EMS realtime component **3790** may further include API **3794**, which controls the ability to use communication with more than one server computer **3520** within server system **3500** to communicate within a session with the market engine **3810**.

The EMS realtime component **3790** may include the ability to encrypt the communication with server system **3500**. Alternatively, the client computer **3780** may include security devices insuring security independently of the method of using the market engine. Additionally both the EMS realtime component **3790** and the client computer **3780** may act together to provide two layers of security. EMS realtime component **3790** may include security module **3796** providing the ability to encrypt the communication with server system **3500**.

Because many components are integrated into the architecture, they are available to all operational functions. The RTOI software component **3750** and RTOI dynamic and static component **3752**, for example, may share the common communications and communicate directly with the RTO participants and RTO staff simultaneously. This permits the creation of integrated user interfaces that contain all of the functions of the services delivered via these systems in a single point of contact. The users are not forced to deal with integration issues and disparate mechanisms to communicate with the RTO.

In certain embodiments of the invention, all individuals wishing to access the RTO systems must establish a login session with the appropriate system.

This applies to RTO participants, RTO staff, as well as other systems that are integrated to the platform. Each login session is established under the protocols of the security integrated into the RTO systems. The location of the session may not be important to the system, allowing the RTO to operate multiple sites. The multiple RTO sites may each operate as a monitor site, a failover site, or to share workload. Login session at multiple sites can be connected to server system **3500** simultaneously, and are synchronized by server system **3500**.

Each RTO participant may share the same security information for authorized scheduling entities (ASEs), RTO operators, and transmission operators (TOs). This security information may be maintained through the registration interface, through which all permissions for each participant may be maintained. This information may be used to validate all login sessions.

Access to the server system **3500** and/or server computer **3560** may be obtained by establishing a login session with the appropriate system. This may apply to RTO participants, including ASEs, RTO operators, and TOs, as well as other computer systems, such as EMS/SCADA systems. This ensures that only authorized individuals and systems can access the APX systems.

The security information may be checked each time that an RTO participant or computer system attempts to log into server system **3500** or server computer **3520** or web server **3560**. Login information may include a login ID and password. Login information may be passed in an encrypted form. If access is permitted, the login session may then be configured in accordance with the permissions associated with the particular login ID.

This ensures that each RTO participant may access only those systems and data to which the participant is authorized.

Access to each system may also be controlled in terms of modes including at least receiving data, placing bids, and viewing positions. This mechanism restricts each login session to its authorized systems, makes available only its authorized information, and does so in only its authorized modes.

Each login session may include a real-time, two-way communication session or a secure web-based connection between the RTO participant software and the servers. Each session may rely on one or more encryption mechanisms to encode the communication. For the real-time connections, this mechanism may include frequent encryption key change, which may further be invisible to the user to ensure privacy of communication between each RTO participant and the systems **3500** and **3560**.

Certain embodiments may include help desk staff. The help desk staff may not have access to market data, scheduling data, or any participant business data. Further, the help desk staff may be unable observe A/S auction or EIS market activity. The help desk staff may not know who or what was selected or dispatched, or at what price. The help desk staff may in certain embodiments only monitor system conditions, such as the number of sessions logged on, the level of activity in the market (for performance monitoring), and when bidding is opened or closed. The help desk staff may maintain reliable data archives and backups on all servers. The help desk staff may perform these maintenance and archival tasks without regard to content.

In certain embodiments, certified users are primarily approved scheduling entities (ASEs), the control area operators (CAOs), and the RTO operators (regardless of location). These certified users may participate in the RTO at the operational level, using services of the server system **3500** or web server **3560**.

The invention also comprises a method of operating a client computer communicatively coupled to an engine system. The engine system includes at least one of the following: a market engine, a scheduling engine and a settlement engine. The client computer communicating with the engine system supports certified client transactions regarding market intervals. Each market interval contains at least one fungible, ephemeral commodity, a location and a time interval.

An engine group includes at least two engine group computers, each implementing a market engine, a scheduling engine or a settlement engine. Note that two engine group computers may redundantly implement a market engine. Alternatively, two engine group computers may redundantly implement a scheduling engine. Additionally, two engine group computers may redundantly implement a settlement engine. An engine group may include two engine group computers implementing different engines. The engine group provides multiple access mechanisms by which communications between the client computer and the engine system may take place.

Note that the engine system may include one or more engine groups. Note that the engine system may be implemented as an engine group.

The client computer may interact with at least one member of the engine group by establishing the client computer as the certified client through communication with the engine system and participating as the certified client communicating with the engine system.

The engine group advantageously removes the potential for a single point of failure in the communication between the client and the engines implemented by the engine group, increasing the overall communication system reliability.

Figure **2E** depicts a collection of client computers **3700**, **3720**, **3740**, **3760** and **3780** respectively coupled through network **3200**, as depicted in Figure **2E**, with further refinements showing a program system **4000** supporting communicating with one or more members of the engine system, as well as encryption devices.

Program system **4000** contains program steps residing in the accessibly coupled memory of the client computers, implementing the method of operating the client computers in their communicative interactions with one or more of the engines or the engine group shown in Figure **2E**. Note that any client computer may accessibly coupled to more than one kind of memory. The discussion herein refers to accessibly coupled memory as including any memory, which can even once be accessibly coupled to the client computer.

The MOPI realtime component **3710** may include the program system **4000**, or be included within the program system **4000** as the implementation of the method of operating the client computer to communicatively interact with one or more of the engines or the engine group shown in Figure **2E**.

Client computer **3700** may interact with at least one member of the engine group by establishing the client computer as the certified client through communication with the engine system and participating as the certified client communicating with the engine system.

The MOPI realtime component **3730** may include the program system **4000**, or be included within the program system **4000** as the implementation of the method of operating the client computer to communicatively interact with one or more of the engines or the engine group shown in Figure **2E**.

API component **3734** may include the program system **4000**, or be included within the program system **4000** as the implementation of the method of operating the client computer to communicatively interact with one or more of the engines or the engine group shown in Figure **2E**.

Security module **3736** may be included in program system **4000**. Alternatively, security module **3736** may be used through a software interface by program system **4000**. Security module **3736** may include a third party vendor supplied software component. Security module **3736** may include an implementation of the Secure Socket Layer protocol.

Client computer **3720** may include security device **3800** insuring security independently of the method of using the market engine or the software controlling client computer **3720**. Additionally both the MOPI realtime component **3730** and the client computer **3720** may act together to provide two layers of security. MOPI realtime component **3730** may include security module **3736** providing the ability to encrypt the communication with server system **3500**.

Client computer **3720** may be coupled **3802** to encryption device **3800**. Client computer **3720** may control the operation of encryption device **3800**.

The RTOI software component **3750** may include the program system **4000**, or be included within the program system **4000** as the implementation of the method of operating the client computer to communicatively interact with one or more of the engines or the engine group shown in Figure **2E**.

API component **3754** may include the program system **4000**, or be included within the program system **4000** as the implementation of the method of operating the client computer to communicatively interact with one or more of the engines or the engine group shown in Figure **2E**.

Security module **3756** may be included in program system **4000**. Alternatively, security module **3756** may be used through a software interface by program system **4000**. Security module **3756** may include a third party vendor supplied software component. Security module **3756** may include an implementation of the Secure Socket Layer protocol.

Encryption receiver **3810** may receive **3812** messages from one or more of the engine group from network **3200**. The results of processing the received message may be conveyed **3814** to client computer **3740**.

Encryption transmitter **3820** may receive **3822** messages from client computer **3740** to be encrypted. The encrypted messages may then be sent **3824** from encryption transmitter **3820** to network **3200**.

In certain embodiments of the invention, a single security device may incorporate encryption receiver **3810** and encryption transmitter **3740**.

Encryption receiver **3810** may receive **3812** messages from and encryption transmitter **3820** may transmit **3824** messages to the same engine of the engine system. Encryption receiver **3810** may receive **3812** messages from and encryption transmitter **3820** may transmit **3824** messages to different engines of the engine system.

The RTOI realtime component **3770** may include the program system **4000**, or be included within the program system **4000** as the implementation of the method of operating the client computer to communicatively interact with one or more of the engines or the engine group shown in Figure **2E**.

API component **3774** may include the program system **4000**, or be included within the program system **4000** as the implementation of the method of operating the client computer to communicatively interact with one or more of the engines or the engine group shown in Figure **2E**.

Security module **3776** may be included in program system **4000**. Alternatively, security module **3776** may be used through a software interface by program system **4000**. Security module **3776** may include a third party vendor supplied software component. Security module **3776** may include an implementation of the Secure Socket Layer protocol.

The EMS realtime component **3790** may include the program system **4000**, or be included within the program system **4000** as the implementation of the method of operating the client computer to communicatively interact with one or more of the engines or the engine group shown in Figure **2E**.

API component **3792** may include the program system **4000**, or be included within the program system **4000** as the implementation of the method of

operating the client computer to communicatively interact with one or more of the engines or the engine group shown in Figure **2E**.

Client computer **3700** may include encryption device **3830** insuring security independently of the method of using the market engine. Both the EMS realtime component **3790** and client computer **3700** may act together to provide two layers of security. EMS realtime component **3790** may include security module **3796** providing the ability to encrypt the communication with server system **3500**.

Communication **3832** between client computer **3780** and encryption device **3830** may utilize memory access mechanism **3784**. The memory access mechanism **3784** may be across a general-purpose bus. Communication **3832** may act as an input-output port scheme on the general-purpose bus.

Communication **3832** may also be implemented by use of a memory-mapping scheme whereby encryption device **3830** is accessed **3784** by special addresses **3832** in the memory domain.

Note that a client computer system may employ more than one security device. Further, a client computer system may employ different security measures in communication with different engines of the engine system.

Figure **3A** depicts a virtual trading floor **1000**, containing validated orders and market intervals with associated market states and further containing a certified client collection of certified clients.

The virtual trading floor mechanism **1000** comprises a collection of market intervals, each with an associated market state, and validated orders. A

market contains a product type and a location. Trading in the market is done in terms of market intervals **1100**, **1120**, and **1140** as well as specialized market intervals including transfer intervals **1160** and macro market intervals **1200**, **1210** and **1220**.

Each market interval of a market contains the market product type, market location, plus a calendar scheme with an interval end. The market state of a market interval comprises a market price for the market interval product type at the market interval location during the market interval time interval.

Note that some market intervals such as market interval **1160** are further denoted as transfer intervals, further shown in Figure **3D**. A transfer interval **1160** includes a location further distinguished as having a start location **1163** and a delivery location **1164**. For many fungible non-ephemeral commodities, not only is a product type **1161** specified, but also a transfer type **1162** is specified. By way of example, a container of wheat may be transported by truck, train, barge or ship. As with other market intervals, there is a time interval **1165** involved, which designated the expected time of transport.

Macro market intervals **1200**, **1210**, and **1220** are also shown. These are specialized market intervals which reflect at least one origin market interval and at least one destination market interval. Figure **3E** provides a more detailed discussion of macro markets for fungible non-ephemeral commodities. Figure **3F** provides a more detailed discussion of macro markets for fungible ephemeral commodities.

A validated order may contain an amount of the market interval product type, a price for the market interval product type. The validated order is either a bid validated order or an ask validated order.

Figure **3A** also depicts a certified client collection comprised of certified clients. Certified clients may include, but are not limited to, human beings. Certified clients may further include, but are not limited to, corporate entities. Certified clients may also further include agents authorized by the certified clients to represent them in interactions regarding the virtual trading floor. Certified clients may also further include software agents executing on software agent computers authorized by certified clients to represent them in interactions regarding the virtual trading floor. Note that in certain embodiments of the invention, the market engine manages and/or maintains the certified client collection.

A virtual trading floor may support trading ephemeral, fungible commodities of an electrical power grid containing at least one AC power network. Each AC power network further contains a node collection of at least two nodes. The product type of the market intervals of the market interval collection may be a member of a product type collection comprised of energy and AC power transfer. The location of a market interval having an energy product type may be a first node of the node collection of an AC power network contained in the electrical power grid. The location of a market interval having an AC power transfer product type may be from a first node of a first AC power network contained in the electrical power grid to a second node of the first AC power network.

Some certified clients may be market makers **1440**. Market makers are market participants who have taken on the additional role of attempting to arbitrage in transmission.

For fungible ephemeral commodities, market makers **1440** use the transaction system to access point-to-point transmission orders and individual flowgate orders. Market makers **1440** may also have their own inventories of point-to-point transmission rights and flowgate rights, which they may or may not choose to post in the market.

Market makers **1440** may also be described as market providers in certain economic systems, where the term "market maker" has a pre-established and divergent meaning.

Market makers **1440** may receive "request for quotes" from other certified clients. In energy markets, these requests may be triggered whenever a participant opens an Energy Market screen for a particular facility, market, strip, and lot size. Using mathematical models of their own choosing, market makers may generate quotes for the transmission products displayed on the participant's screen. These quotes may be submitted to the transaction system as market maker quotes.

The transaction system may identify market maker quotes, and may keep them separate from the standing orders submitted by participants who actually own, or wish to buy, transmission. The reason is that the market maker quotes are derived from the standing orders, and market makers will not want to consider these derived quotes when creating new derived quotes.

If they did, the number of possibilities for them to consider would explode, with no gain in information.

Market makers may interactively submit their quotes to the transaction system. Speed in calculating quotes would be of the essence, since the only real risk to the market maker is posting a quote based on stale data.

Market makers may withdraw their quotes at any time, even after the participant has signaled his/her acceptance and it is on the way back through the network to the market maker. Market makers may not, however, refuse an order that is based on a quote that is still posted at the time they receive that order. Not having this rule would open the way for all kinds of gaming by market makers, which would undermine the integrity of the market. Like market makers everywhere, market makers in this system must be constantly reevaluating and updating their quotes.

A single market could have multiple competing market makers. Market makers may compete for competitive advantage based on the speed of their responses (thereby minimizing losses due to stale quotes), the ability of their algorithms to find the best price, their skill at maintaining strategic inventories of flowgates and point-to-point transmission rights, and their operating costs. This kind of competition encourages innovation, low costs, and liquidity, and is good for the participants.

Market makers may be allowed to go into a negative position in individual flowgate rights, or even point-to-point rights, assuming they have sufficient credit with the RTO. If the market maker is still in a negative position at the scheduling deadline, he/she will be billed for the missing transmission rights,

just as if they had submitted an uncovered schedule. To the participant who bought the transmission right from a market maker with a negative position, the transmission right is the same as any other. This rule provides a "cushion" that insures liquidity in the market. It means that market makers always have a way to quote a price for any transmission the participants may desire to buy or sell. The rule is harmless, in such embodiments, all of these transmission rights affect only the financial settlement.

Allowing market makers to go into negative positions in transmission rights also removes any incentive to hoard transmission rights. Without this rule, hoarding could be attractive in a system with hundreds of flowgates, since one participant could buy up all the rights to some flowgate that is not perceived as scarce for very little money. Without a liquid market in even one flowgate, it might be impossible for market makers to create quotes for many point-to-point rights.

There may be rules prohibiting a single participant from owning more than a certain fraction of a single flowgate. But such rules require policing and can get in the way of some participants with legitimate needs, and might not be effective if several participants act in concert (with or without explicit collusion).

The RTO's role may begin with the initial auctions. The RTO auctions both flowgate rights and point-to-point rights, based on an algorithm that maximizes the value received. This algorithm is similar to the algorithm currently used by PJM to auction FTRs.

Thus, once a new transmission provider is acknowledged by the RTO, it would enter the revenue process at the RTO auction by becoming part of the trading followed by scheduling followed by settlement processes.

Under normal conditions, the RTO stands behind all point-to-point rights, both those auctioned initially and those created (and recreated) by market makers and participants. Any participant can obtain reasonable price certainty by buying a point-to-point right. In the event that one of the 400 flowgates has to be de-rated, the RTO may buy back the flowgate rights or optionally redispatch around the problem.

In the event that a new constraint appears in the system that is not one of the traded flowgates, the RTO may buy back existing flowgate rights in order to force flows to meet the new constraint, or optionally redispatch around the problem. No new flowgates are ever added after the initial auction. With hundreds of degrees of freedom, the RTO has plenty of levers to deal with virtually any constraint that may occur. The real-time LMP runs as if the constraints are on the traded flowgates that the RTO actually uses to limit flow, not the unrepresented constraint.

In general, not representing a constraint in the network creates a potential opportunity for gaming, since the participant could create congestion on the constraint, then get paid by the RTO to mitigate it. However, in a system with hundreds of flowgates, an individual participant is not likely to be able to create much congestion on an unrepresented constraint without exceeding the limit on flowgates that are represented. If the congestion on the unrepresented constraint is due to an equipment failure, the RTO may pay to mitigate the problem, as it would do under FTRs.

In extreme situations, it may not be possible for the RTO to buy back flowgate rights or redispatch at a reasonable cost. In these situations, the RTO may be allowed to buy-back rights from participants on a pro-rata basis at a preset ceiling price.

Such bundled point-to-point rights possess at least the following advantages.

- Forward price discovery of congestion costs allows planning of unit maintenance, unit commitment, and hydroelectric resources.
- Bundled point-to-point rights advantageously minimize market involvement of RTO in the market, including involvement in the selection of commercially significant flowgates.
- Easily traded market instruments for hedging congestion costs, providing virtually complete hedging of risk for participants.
- Flowgates provide a mechanism for resolving seams issues between control areas.
- Bundled point-to-point rights with a flowgate foundation assure least cost redispatch within system constraints.
- Bundled point-to-point rights with a flowgate foundation give a complete set of congestion costs between all locations at delivery time.
- Bundled point-to-point rights with a flowgate foundation support participants producing and consuming energy with minimal advance scheduling.

- Bundled point-to-point rights with a flowgate foundation provide the ability to handle large numbers of constraints.

Figure **3B** depicts a market interval containing a product type, location and time interval. The product types may include ephemeral, fungible commodities. All product types may be ephemeral, fungible commodities.

Location may refer to a single node. A node may be specified geographically. A node may be specified in terms of nodes in a network. The network may contain both a collection of nodes and a collection of lines, each line extends from a first node to a second node. Note that the term line as used herein does not exclusively imply a straight line. A node may be specified in terms of a node of a network contained in a grid of one or more networks, further containing special lines connecting nodes of potentially distinct networks.

Location may additionally refer to a transition or transfer from a first node to a second node.

A market interval has a uniform price for its product type within the time interval. A market interval may also have uniform buy and sell positions, to support uniform movement of the product within the market interval. A single market interval may be seen to act as an independent commodity market of the fungible, ephemeral commodity for its product type.

Figure **3C** depicts a refinement of a market interval as depicted in Figure **3B** further containing multiple time intervals.

In Figure **3C**, two time intervals are depicted by way of example. More than two time intervals may be contained in one market interval. Each of the

multiple time intervals may not temporally overlap the other contained time intervals of the market interval.

Note that both market positions and market prices may have similar formats. Both market positions and market prices may include representations as a quantity, which is a scalar value, and a point or set of points over a calendar line known herein as a time interval. Arithmetic functions and operations including, but not limited to, addition, subtraction, negation, multiplication, minimums and maximums are readily extended to apply to these scalar values over calendar time.

As stated elsewhere in this document, the minimal condition placed upon the time intervals of a market interval is that they not overlap. It is often advantageous to place further constraints on market intervals in terms of the orders submitted to a virtual trading floor.

These constraints can be thought of as follows: if order market intervals were the footprints on the calendar line, a strip may be considered the shoe that left those footprints. While there may be an indefinitely large number of orders covering the calendar line, there are usually only a small finite number of shoes, i.e. strips involved with those orders. An order's market interval may be further constrained to only begin at discrete points on the calendar line.

By way of example, consider the following strips:

An hourly strip is a market interval that allows orders to be submitted for market intervals that start on the hour and last for an hour.

A daily strip is a market interval that allows orders to be submitted for market intervals that start on the local time day boundary and end on local time boundaries. As used here, local time means the local time with respect to the location of the market segment. Note that because the strip is specified in terms of the local time, the actual length may vary depending on the current calendar day at that location. For example, during daylight to standard time transition in the United States, the daily strip spans 25 hours instead of the standard 24 hours.

A daily off-peak strip allows orders for market intervals that start at the local time day boundary and continue until 6:00 AM local time and then start again at 10:00 PM and continue until the ending day boundary.

Other examples may include, but are not limited to, five-minute strips, monthly strips and yearly strips. The set of strips a market may support must ensure that orders are submitted for non-partially overlapping intervals. These constraints require that strips either be sub-periods of another strip or compliment the strip. An example of two strips, which cannot co-exist in the same market, are the weekly strip and the monthly strip. This is because not all weeks are sub-periods of any one month.

A lot is the quantity in multiples of which an order must be contracted.

A basic function of a market segment is to match buy and sell orders at a single price. Certain embodiments of the invention will satisfy differing rules established for different markets belonging to different regulatory regions regarding that matching process. By way of example, in a bid-ask market, an incoming buy/sell order is immediately matched with the best buy/sell order

standing in the market with the trade price as the limit price of the standing order.

In a call-auction market, buy and sell orders are collected together in a batch and matched sometime after they have been submitted. All orders in the batch are traded at the same price, which is calculated based upon the limit prices of all orders in the batch.

Figure **3D** depicts a macro market interval **1500** for a fungible, ephemeral commodity from Figure **3A**.

The invention also comprises a method of a certified client interactively using a transaction system supporting transactions involving at least one fungible, ephemeral commodity.

Figure **4** depicts a detail flowchart of operation **5000** of Figure **2A-2E** for method of a certified client interactively using a transaction system supporting transactions involving at least one fungible, ephemeral commodity.

Arrow **5010** directs the flow of execution from starting operation **5000** to operation **5012**. Operation **5012** performs the certified client initiating at least one action in the transaction system. Arrow **5014** directs execution from operation **5012** to operation **5016**. Operation **5016** terminates the operations of this flowchart.

The method is further comprised of at least two of the following operations belonging to the basic usage collection.

Arrow **5020** directs the flow of execution from starting operation **5000** to operation **5022**. Operation **5022** performs managing at least one user

resource. Arrow **5024** directs execution from operation **5022** to operation **5016**. Operation **5016** terminates the operations of this flowchart.

Arrow **5030** directs the flow of execution from starting operation **5000** to operation **5032**. Operation **5032** performs managing a bilateral trading portfolio comprising at least one bilateral trade in at least one of the fungible, ephemeral commodities. Arrow **5034** directs execution from operation **5032** to operation **5016**. Operation **5016** terminates the operations of this flowchart.

Arrow **5040** directs the flow of execution from starting operation **5000** to operation **5042**. Operation **5042** performs managing a market position portfolio comprising at least one market position of at least one of the fungible, ephemeral commodities. Arrow **5044** directs execution from operation **5042** to operation **5016**. Operation **5016** terminates the operations of this flowchart.

Arrow **5050** directs the flow of execution from starting operation **5000** to operation **5052**. Operation **5052** performs managing a market trading collection comprising at least one market trade in at least one of the fungible, ephemeral commodities. Arrow **5054** directs execution from operation **5052** to operation **5016**. Operation **5016** terminates the operations of this flowchart.

Arrow **5060** directs the flow of execution from starting operation **5000** to operation **5062**. Operation **5062** performs managing a credit resource collection comprising at least one credit resource. Arrow **5064** directs execution from operation **5062** to operation **5016**. Operation **5016** terminates the operations of this flowchart.

Arrow **5070** directs the flow of execution from starting operation **5000** to operation **5072**. Operation **5072** performs managing compliance reporting

based upon at least one of the collection comprising the user resources, the market position portfolio, the bilateral trading portfolio and the market trading collection. Arrow **5074** directs execution from operation **5072** to operation **5016**. Operation **5016** terminates the operations of this flowchart.

Figure **5A** depicts a detail flowchart of operation **5012** of Figure **4** for the certified client initiating the action in the transaction system.

Arrow **5190** directs the flow of execution from starting operation **5012** to operation **5192**. Operation **5192** performs the certified client initiating a bid for a market interval at a bid price and a bid amount as a first validated order in the transaction system. Arrow **5194** directs execution from operation **5192** to operation **5196**. Operation **5196** terminates the operations of this flowchart.

Arrow **5200** directs the flow of execution from starting operation **5012** to operation **5202**. Operation **5202** performs the certified client initiating an ask for a market interval at a ask price and a ask amount as a second validated order in the transaction system. Arrow **5204** directs execution from operation **5202** to operation **5196**. Operation **5196** terminates the operations of this flowchart.

Arrow **5210** directs the flow of execution from starting operation **5012** to operation **5212**. Operation **5212** performs the certified client responding to a financial commitment presented by the transaction system to create a financial response to the financial commitment in the transaction system. Arrow **5214** directs execution from operation **5212** to operation **5196**. Operation **5196** terminates the operations of this flowchart.

Arrow **5220** directs the flow of execution from starting operation **5012** to operation **5222**. Operation **5222** performs reporting at least one of the bilateral trades to the transaction system. Arrow **5224** directs execution from operation **5222** to operation **5226**. Operation **5226** terminates the operations of this flowchart.

Arrow **5230** directs the flow of execution from starting operation **5012** to operation **5232**. Operation **5232** performs confirming at least one of the bilateral trades to the transaction system. Arrow **5234** directs execution from operation **5232** to operation **5226**. Operation **5226** terminates the operations of this flowchart.

Figure **5B** depicts a detail flowchart of operation **5212** of Figure **5A** for the certified client responding to the financial commitment presented by the transaction system.

Arrow **5250** directs the flow of execution from starting operation **5212** to operation **5252**. Operation **5252** performs the certified client responding to the financial commitment presented by the transaction system to create a financial payment of the financial commitment in the transaction system. Arrow **5254** directs execution from operation **5252** to operation **5256**. Operation **5256** terminates the operations of this flowchart.

Arrow **5260** directs the flow of execution from starting operation **5212** to operation **5262**. Operation **5262** performs the certified client responding to the financial commitment presented by the transaction system to create a financial counter-response to the financial commitment in the transaction

system. Arrow **5264** directs execution from operation **5262** to operation **5256**. Operation **5256** terminates the operations of this flowchart.

Figure **6A** depicts a validated order **1200** of the validated order collection.

Validated order **1200** has an associated **1300** market interval **1100-N** of the market interval collection. The market interval collection is separately maintained in certain embodiments of the invention. Maintaining the validated order collection and market interval collections may be coupled.

Each validated order **1200** further contains a member of the order type collection **1310** which is either a bid order **1312** of the associated **1300** market interval **1100-N** or an ask validated order **1314** of the associated **1300** market interval **1100-N**.

Figure **6B** depicts a refinement of Figure **6A** of a validated order **1200** of the validated order collection.

As depicted in Figure **6A**, validated order **1200** has an associated **1300** market interval **1100-N** of the market interval collection. The market interval collection is separately maintained in certain embodiments of the invention. Maintaining the validated order collection and market interval collections may be coupled.

As depicted in Figure **6A**, each validated order **1200** further contains a member of the order type collection **1310** which is either a bid order **1312** of the associated **1300** market interval **1100-N** or an ask validated order **1314** of the associated **1300** market interval **1100-N**.

A validated order may contain **1320** an amount **1322** of the product type **1110-N** of the associated **1300** market interval **1100-N**.

A validated order may contain **1330** a price **1332** of the product type **1110-N** of the associated **1300** market interval **1100-N**.

Figure **7A** depicts a refinement of Figure **3B** of a market interval of an energy product type. The product type **1110** of the market interval is further described as an energy product type **1110**. The location **1112** is a first node of an AC power network contained in the electrical power grid.

Figure **7B** depicts a refinement of Figure **3B** of a market interval of an AC power transfer product type. The product type **1110** of the market interval is further described as an Energy product type **1110**. The location **1112** is from a first node of a first AC power network contained in the electrical power grid to a second node of the first AC power network. Note that this form of location represents a transmission between the first node of the first AC power network and the second node of the first AC power network.

Figure **7C** depicts a refinement of Figure **7B** of a market interval of an AC power transfer product type. The product type **1110** of the market interval is described as an Energy product type **1110**. The location **1112** is a flowgate of the flowgate collection of a first AC power network contained in the electrical power grid. Note that flowgates can represent a congestion constraint across more than one transmission line, and may not have a specific first node to second node description.

Such embodiments of the invention of a flowgate market interval are advantageous in providing a market to trade transfer capability between

users. Because of the linear nature of AC power transfer throughout an AC power network, these transfer rights can be linearly accumulated to insure the contracted transfers are physically feasible in satisfying the overall flowgate constraints of the AC power network.

Figure **7D** depicts a refinement of Figures **7B** and **7C** of a market interval of an AC power transfer point-to-point product type. The product type **1116** of the market interval is a refinement of the AC power product type **1110** as depicted in Figure **7B**. The product type **1116** of the market interval is further described as an Energy product type **1110**. The location **1112** is from a first node of a first AC power network contained in the electrical power grid to a second node of the first AC power network.

Note that as in Figure **7B**, this form of location represents a transmission between the first node of the first AC power network and the second node of the first AC power network. However, a market interval for an AC power transfer point-to-point product type further possesses all the ancillary flowgate transmission rights required for the power transmission from the first node to the second node of the AC power network.

Such market intervals support trading in bundles of flowgates rights as point-to-point rights. From a user perspective, point to point rights are what the market participants really want to buy and sell. They are much simpler to deal with and comprehend than flowgate rights.

In terms of maintaining market liquidity, participants should be very comfortable posting bids and offers for point-to-point AC power transfer rights, since they constitute complete products from a participant perspective.

Bids for AC power transfer point-to-point market intervals are comprised of bids for at least one flowgate transmission right sharing the same location. Bids for AC power transfer point-to-point market intervals may further comprise bids for each of the flowgates of the flowgate collection sharing the same location. Bids for AC power transfer point-to-point market intervals may further comprise transmission rights for at least one flowgate with differing location. This advantageously supports creating transmissions canceling adverse effects on one or more flowgates.

Figure **8** depicts a validated order **1200** comprised of at least two validated orders, each with an associated market interval.

Validated order **1200-1** has an associated **1300-1** market interval **1100-N-1** of the market interval collection. Validated order **1200-1** further contains a member of the order type collection **1310-1** which is either a bid order **1312** of the associated **1300** market interval **1100-N-1** or an ask validated order **1314** of the associated **1300** market interval **1100-N-1**.

Validated order **1200-2** has an associated **1300-2** market interval **1100-N-2** of the market interval collection. Validated order **1200-2** further contains a member of the order type collection **1310-2** which is either a bid order **1312** of the associated **1300** market interval **1100-N-2** or an ask validated order **1314** of the associated **1300** market interval **1100-N-2**.

Validated order **1200-3** has an associated **1300-3** market interval **1100-N-3** of the market interval collection. Validated order **1200-3** further contains a member of the order type collection **1310-3** which is either a bid order **1312** of

the associated **1300** market interval **1100-N-3** or an ask validated order **1314** of the associated **1300** market interval **1100-N-3**.

There may be no specific limit to the number of validated orders comprising a validated order. There may be a limit to the number of validated orders comprising a validated order.

The associated market intervals of multiple validated orders within a validated order may share the same product type. The associated market intervals of multiple validated orders within a validated order may share the same location.

The associated market intervals of multiple validated orders within a validated order may differ in product type. The associated market intervals of multiple validated orders within a validated order may differ in location.

As discussed in the background, the physics of AC power networks indicates each AC power network contained in the electrical power grid further contains a flowgate collection of flowgates. Each flowgate location being either from an associated first node of the AC power network to an associated second node of the AC power network, or in the case of a collection of constrained transmission lines, will be denoted by a flowgate designator. An AC power transfer amount from node1 to node2 produces an amount of AC power transfer across the flowgate as essentially an associated linear, skew-symmetric function of the amount from node1 to node2, for each of the flowgates of the flowgate collection. For each of the flowgates of the flowgate collection, there is at least one market interval in the market interval collection of AC power transfer product type with the flowgate location.

Each validated order of the validated order collection with the AC power transfer product type of the associated market interval may further contain an amount. A validated order of AC power transfer product type from the first node to the second node may be further comprised of a validated order of the flowgate associated market interval. The amount ordered for that flowgate is essentially the associated linear, skew-symmetric function of the amount from the first node to the second node, for each of the flowgates of the flowgate collection.

Note that there may be a price associated with each validated order of the AC power transfers of the flowgates. There may be a price associated with the AC power transfer from the first node to the second node.

Figure **9A** depicts a market interval of a DC power line. An electrical power grid may further contain a DC power line collection of at least one DC power line at the location of the DC power line from a first node of a first AC power network to a second node of a second AC power network. The product type collection further comprises DC power transfer. For each DC power line of the DC power line collection, there is at least one associated market interval with DC power transfer product type, with the location as the location of the DC power line.

Figure **9B** depicts market interval **1100** of Figure **3B** further containing a window time interval during which the market interval is active only within the window time interval. The window time interval of the market interval entirely occurs before the time interval contained in the market interval for each market interval.

Figure **9C** depicts market interval **1100** of Figure **9B** containing a window time interval and multiple time intervals. Each of the time intervals does not overlap the other time intervals. The window time interval occurs before each of the time intervals.

Note that the invention may comprise managing more than one generator of a fungible, ephemeral commodity. The invention may include managing a first generator of a first fungible, ephemeral commodity and managing a second generator of a second fungible, ephemeral commodity. The invention may also include managing a generator of more than one fungible, ephemeral commodity.

The invention may include managing more than one load consuming a fungible, ephemeral commodity. The invention may include managing a first load consuming a first fungible, ephemeral commodity and managing a second load consuming a second fungible, ephemeral commodity. The invention may also include managing a load consuming more than one fungible, ephemeral commodity.

The invention may include managing more than one import providing a fungible, ephemeral commodity. The invention may include managing a first import providing a first fungible, ephemeral commodity and managing a second import providing a second fungible, ephemeral commodity. The invention may also include managing a import providing more than one fungible, ephemeral commodity.

The invention may include managing more than one export consuming a fungible, ephemeral commodity. The invention may include managing a first

export consuming a first fungible, ephemeral commodity and managing a second export consuming a second fungible, ephemeral commodity. The invention may also include managing an export consuming more than one fungible, ephemeral commodity.

As used herein, presenting something to a certified client who is human may include, but is not limited to, visually displaying that something, placing a presentation of that something into a windowing system, which may be directed to display the something by the human and acoustically presenting that something to the certified client.

Presenting something to a certified client operating a computer interacting within the transaction system may further include, but is not limited to, transmitting a presentation of the something to the client computer. The client computer may further receive and process the presentation.

Presenting something to a software agent operating a software agent computer may include, but is not limited to, inserting or adding the processed presentation into a fact database accessible by the software agent.

Figure **10** depicts a view of certified client user interface **7000** showing an ordering screen with hourly time interval based market intervals for a specific energy market.

Note that in Figures **10** to **16**, which show various views of certified client user interfaces, managing a market trading position portfolio is illustrated based upon the assumption that the certified client is actively trading.

In circumstances where the certified client is not actively trading, as for instance in situations regarding certified clients such as homes, factories and farms consuming and/or generating power below the minimum lot size, minor variants of Figures **10** to **16** would show the market position portfolios.

In general, managing a market trading portfolio is similar to managing a market position portfolio with the added capability

Client display screen **7000** may interactively show the market state of a number of related market intervals. Client display screen **7000** may indicate the market state of market intervals sharing the same product type **7004** and location **7002** and for successive time intervals **7008** for November 11, 1998 as indicated by highlighted lettering in calendar **7030**.

The column **7006** labeled "Market Time Hour Ending (ST)" has a succession of rows with entries from 1 to 24, indicating the hourly energy markets **7004** in the Illinois sell zone **7002**. Consider the row labeled by the hour **7008** ending at "3". This row displays the market state of the market interval with energy product type, Illinois sell zone location and hour time interval ending at 3:00 for November 11, 1998. The current market price in dollars per megawatt-hour **7010** is "12.96". The contracted position in net megawatts **7012** is "12.00". The pending position in net megawatts **7014** is "13.00". The total position in net megawatts **7016** is "25.00", which is the sum of the contract and pending positions for that market interval. The highest bid quantity in net megawatts-hours **7018** is "26.98". The highest bid price in dollars per megawatt-hour **7020** is "11.71". The highest ask quantity in net megawatts-hours **7022** is "38.84". The highest ask price in dollars per megawatt-hour **7024** is "14.21".

Figure **11** depicts a view of certified client user interface **7100** showing an ordering screen for daily on-peak time interval based market intervals for a specific energy market.

Client display screen **7100** may interactively show the market state of a number of related market intervals. Client display screen **7100** may indicate the market state of market intervals sharing the same product type **7104** and location **7102** and for successive time intervals **7106** from November 7, 1998 to November 24, 1998 as indicated by highlighted lettering in calendar **7130**. Consider the row for 11/12/1998.

The column labeled "Market Time Day Ending" has a succession of rows with entries from 11/07/1998 to 11/23/1998, indicating the daily on peak energy markets **7104** in the Illinois sell zone **7102**.

The current market price in dollars per megawatt-hour **7110** is "16.72". The contracted position in net megawatts **7112** is "10.00". The pending position in net megawatts **7114** is "0.00". The total position in net megawatts **7116** is "10.00", which is the sum of the contract and pending positions for that market interval. The highest bid quantity in net megawatts-hours **7118** is "25.50". The highest bid price in dollars per megawatt-hour **7120** is "20.61". The lowest ask quantity in net megawatts-hours **7122** is "35.50". The lowest ask price in dollars per megawatt-hour **7124** is "23.28".

Figure **12** depicts a view of certified client user interface **7200** showing an ordering screen for hourly time interval based market intervals for a specific flowgate market.

The displayed information **7200** includes a variety of fields, including field **7202**, where a specific flowgate or intertie may be selected. Immediately below that field is field **7204** specifying commodity type, in this case, "Hourly Flowgate". The column indicated by **7210** represents the current market price. The column to its right **7212** indicates the amount of the commodity already awarded. The box **7206** points to two columnar components. The left component represents the bid quantity and the right component represents the bid price per unit quantity on each row. Note that each row represents a distinct market interval, trading independently of the other market intervals.

Client display screen **7200** may show the market state of a number of related market intervals, may indicate the market state of market intervals sharing the same product type **7204** and location **7202** and for successive time intervals for May 10, 1999 as indicated by highlighted lettering in calendar **7230**.

The column labeled "Market Time Hour Ending (DT)" **7208** has a succession of rows with entries from 1 to 24, indicating the hourly AC power transfer markets **7204** in the flowgate location "Flowgate_a" **7202**. Consider the row labeled by the hour **7208** ending at "1". This row displays the market state of the market interval with AC power transfer product type, flowgate **7202** location and hour time interval ending at 1:00 for May 10, 1999. The current market price in dollars per megawatt-hour **7210** is "0.00". The contracted position in net megawatts **7212** is "0.00". The pending position in net megawatts **7214** is "0.00". The total position in net megawatts **7216** is "0.00", which is the sum of the contract and pending positions for that market interval. The contracted flow **7224** is "0.00". The pending flow **7226** is "0.00". The total flow **7228** is "0.00".

The user interface supporting many flowgates may be very similar to Figures **10**, **11** and **12**, with some added features. In the Energy Market screen of Figures **10** and **11**, there are columns showing the market position in terms of bid and ask summaries.

Figure **13** depicts a view of certified client user interface **7300** showing an ordering screen for hourly time interval based market intervals with respect to a specific facility ("Hyatt Generation") including energy transmission costs from multiple displayed markets.

The more specific information on energy and transmission prices are available in the tabs at the bottom of the screen. There is an "Interval Depth" tab (which may be called "All Market Depth") and a "Market Depth" tab (which may be called "Single Market Depth").

The "Transmission requirements" tab shows the required flowgate transmission rights for a point-to-point transmission from the Hub to the business location.

The column labeled **7302** shows the transmission cost to buy energy at the hub (Market) and transfer it to the business location (Hyatt Generation).

The column labeled **7304** shows the transmission cost to sell energy at the hub (Market) and transfer from the business location (Hyatt Generation). Costs **7302** and/or **7304** may be calculated from current market price of the required flowgate market intervals.

Certain embodiments of the invention include dynamic creation of transmission bids and offers shown in the Energy Market screen. When a

participant opens the Energy Market screen for a particular facility, market, strip, and lot size, a signal is sent to the market makers. They may respond with bids and offers tailored for this particular screen. The dynamic capability may be needed because it is not feasible for market makers to continuously post bids and offers between every hub and every facility location.

Certain embodiments include "Transmission from Hub Depth" and "Transmission to Hub Depth" tabs. These tabs may show, in addition to quantity, price, and possibly credit, codes identifying the market maker making the bid or offer. The reason this information is needed is that different market makers may be relying on reconfiguring the same standing bids and offers to create their bids and offers. Hence, if the participant lifts or hits one of these bids or offers, the other market maker will likely withdraw their corresponding bid or offer. When a participant sees similar bids or offers from two different market makers, it is probably only possible to hit or lift one of them. Another way to deal with this problem might be to only display a stack of bids or offers from one market maker at a time—perhaps the one offering the best price.

When the participant enters a buy or sell order in the appropriate columns and presses the "submit" button, the user interface may display the energy order and a listing of all the flowgates and the transmission quantity through the flowgate required to deliver the energy. The user can check off which orders he/she wishes to place. The user may check all items to do a complete "all-in" order.

Alternatively, the invention includes at least one mechanism where most users could avoid any direct dealings in flowgates. The energy order may be

displayed, along with a single order to buy (for energy purchases) or sell (for energy sales) transmission in the direction of the energy flow, and another order to sell or buy transmission in the direction against the energy flow. The user may check all three items to do a complete "all-in" order. The user who wished to buy energy and transmission without incurring any obligations would check only the first two lines. Users could do energy only orders by clicking only the first line, or transmission only orders by clicking one or both of the transmission lines.

The advantage of this macromarket trading scheme, is that there is just one transaction including the source generation, transmission rights and destination loading, where applicable, which preferably becomes a single contract. This creates a fundamental simplification in the conceptual effort required to trade energy delivery.

Figure **14** depicts a view of certified client user interface **7400** showing an ordering screen for hourly time interval based market intervals from a trade book perspective.

Trade books are useful in the preliminary stages of trading energy, when the principal requirement is to create production and load commitments. A trade book has no business location. By way distinction, a facility always has a location.

Many power utility companies, as well as facilities operators employ a trade book approach for initial, relatively time-distant energy trading, and then switch to a facility based energy trading activity as the time approaches when

scheduling the energy delivery becomes relevant. Such tasks are often performed by two separate groups of people within such organizations.

Note that the certified client may select various markets and at least the presentation use of the visible columns, which become part of the user view, which can be saved, selected and presented by name, such as "CA Hourly/Daily" in field **7402**.

Note that this may effect and/or control the ordering of columns, rows, and/or the sorting of columns and/or rows

Figure **15** depicts a view of certified client user interface **7500** showing an overview trading position for specific hours of two successive days including the trade book and a limited number of certified clients.

A certified client may use view **7500** in the scheduling process.

Figure **16** depicts a detailed view of certified client user interface **7600** showing the trading position for specific hours of two successive days with regards to one certified client based upon Figure **15**.

Figure **16** is sometimes referred to as a "drill down" from Figure **15**.

Figure **17** depicts a view of certified client user interface **7700** providing an overview of the reports on transactions and/or schedules available for presentation to the user.

Figure **18** depicts a view of certified client user interface **7800** providing a detailed view of the monthly invoice for the certified client including fees to the

transaction engine service provider, who may be a first party, (APX Fees **7802**).

Note individual financial obligations **7804** are shown as owed by the certified client to the first party. Responses to the financial statement include payment of the obligation **7804** to the first party. Such payments are a product of the process of using the transaction system of this invention.

Further note that there are potentially several first parties to whom or from whom moneys may be owed or are owing: A service provider supporting at least some of the operations of Figure **4** such as APX may be a first party; a regulatory agency may be a first party; A network operator may be a first party; A public utility company; And often at least one other certified client, who performed or received benefit from the performance of a commitment through use of the transaction system, may also be a first party.

Figure **19** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource.

Arrow **5360** directs the flow of execution from starting operation **5022** to operation **5362**. Operation **5362** performs managing a generator of at least one of the fungible, ephemeral commodities. Arrow **5364** directs execution from operation **5362** to operation **5366**. Operation **5366** terminates the operations of this flowchart.

Arrow **5370** directs the flow of execution from starting operation **5022** to operation **5372**. Operation **5372** performs managing a load consuming at least one of the fungible, ephemeral commodities. Arrow **5374** directs

execution from operation **5372** to operation **5366**. Operation **5366** terminates the operations of this flowchart.

Arrow **5380** directs the flow of execution from starting operation **5022** to operation **5382**. Operation **5382** performs managing a transmission facility for at least one of the fungible, ephemeral commodities. Arrow **5384** directs execution from operation **5382** to operation **5366**. Operation **5366** terminates the operations of this flowchart.

Arrow **5390** directs the flow of execution from starting operation **5022** to operation **5392**. Operation **5392** performs managing an import providing at least one of the fungible, ephemeral commodities. Arrow **5394** directs execution from operation **5392** to operation **5366**. Operation **5366** terminates the operations of this flowchart.

Arrow **5400** directs the flow of execution from starting operation **5022** to operation **5402**. Operation **5402** performs managing an export consuming at least one of the fungible, ephemeral commodities. Arrow **5404** directs execution from operation **5402** to operation **5366**. Operation **5366** terminates the operations of this flowchart.

Figure **20A** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource.

Arrow **5450** directs the flow of execution from starting operation **5022** to operation **5452**. Operation **5452** performs creating a first knowledge interval of the ephemeral, fungible commodity at a first time interval containing a first cost in the knowledge interval collection. Arrow **5454** directs execution from

operation **5452** to operation **5456**. Operation **5456** terminates the operations of this flowchart.

Certain embodiments of the invention include at least one of the two following operations.

Arrow **5460** directs the flow of execution from starting operation **5022** to operation **5462**. Operation **5462** performs maintaining a bid interval collection of bid intervals of the ephemeral, fungible commodity, each comprised of a bid price, a bid amount, and a bid time interval. Arrow **5464** directs execution from operation **5462** to operation **5456**. Operation **5456** terminates the operations of this flowchart.

Arrow **5470** directs the flow of execution from starting operation **5022** to operation **5472**. Operation **5472** performs maintaining an ask interval collection of ask intervals of the ephemeral, fungible commodity, each comprised of a ask price, a ask amount, and a ask time interval. Arrow **5474** directs execution from operation **5472** to operation **5456**. Operation **5456** terminates the operations of this flowchart.

Note that these bid intervals and ask intervals may be related or the same as the bids and asks initiated by the certified client. Such bids and asks may alternatively be integrated into a market trading portfolio.

Figure **20B** depicts a detail flowchart of operation **5452** of Figure **20A** for creating the first knowledge interval.

Arrow **5490** directs the flow of execution from starting operation **5452** to operation **5492**. Operation **5492** performs receiving a knowledge interval

creation message to create a received knowledge interval creation message. Arrow **5494** directs execution from operation **5492** to operation **5496**. Operation **5496** terminates the operations of this flowchart.

Arrow **5500** directs the flow of execution from starting operation **5452** to operation **5502**. Operation **5502** performs creating the first knowledge interval of the ephemeral, fungible commodity at the first time interval containing the first cost in the knowledge interval collection based upon the received knowledge interval creation message. Arrow **5504** directs execution from operation **5502** to operation **5496**. Operation **5496** terminates the operations of this flowchart.

Figure **21A** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource.

Arrow **5570** directs the flow of execution from starting operation **5022** to operation **5572**. Operation **5572** performs determining the ephemeral, fungible commodity needs over a planning time interval. Arrow **5574** directs execution from operation **5572** to operation **5576**. Operation **5576** terminates the operations of this flowchart.

Arrow **5580** directs the flow of execution from starting operation **5022** to operation **5582**. Operation **5582** performs determining an equipment usage plan based upon the knowledge interval collection containing an equipment usage item of the user resource to create a resource operating schedule. Arrow **5584** directs execution from operation **5582** to operation **5576**. Operation **5576** terminates the operations of this flowchart.

The equipment usage item of the user resource is comprised of an activation time and an action belonging to an action collection comprising start-action, stop-action and throttle-action.

Arrow **5590** directs the flow of execution from starting operation **5022** to operation **5592**. Operation **5592** performs operating the equipment usage item of the user resource based upon the device operating schedule. Arrow **5594** directs execution from operation **5592** to operation **5576**. Operation **5576** terminates the operations of this flowchart.

Figure **21B** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource.

Arrow **5610** directs the flow of execution from starting operation **5022** to operation **5612**. Operation **5612** performs examining an equipment usage collection comprised of equipment usage entries to create the ephemeral, fungible commodity needs over the planning time interval. Arrow **5614** directs execution from operation **5612** to operation **5616**. Operation **5616** terminates the operations of this flowchart.

Each equipment usage entries contains a delivery time and a need schedule for the ephemeral, fungible commodity. The ephemeral, fungible commodity needs over the planning time interval comprise an amount.

The ephemeral, fungible commodity needs over the planning time interval further comprise a cost limit.

Figure **21C** depicts a detail flowchart of operation **5192** of Figure **5A** for the certified client initiating the bid.

Arrow **5630** directs the flow of execution from starting operation **5192** to operation **5632**. Operation **5632** performs making the bid of a first bid amount at a first bid price within the cost limit for the first time interval of the ephemeral, fungible commodity. Arrow **5634** directs execution from operation **5632** to operation **5636**. Operation **5636** terminates the operations of this flowchart.

Figure **22** depicts a detail flowchart of operation **5592** of Figure **21A** for operating the equipment usage item.

Arrow **5670** directs the flow of execution from starting operation **5592** to operation **5672**. Operation **5672** performs starting the equipment usage item of the user resource based upon the device operating schedule. Arrow **5674** directs execution from operation **5672** to operation **5676**. Operation **5676** terminates the operations of this flowchart.

Arrow **5680** directs the flow of execution from starting operation **5592** to operation **5682**. Operation **5682** performs stopping the equipment usage item of the user resource based upon the device operating schedule. Arrow **5684** directs execution from operation **5682** to operation **5676**. Operation **5676** terminates the operations of this flowchart.

Arrow **5690** directs the flow of execution from starting operation **5592** to operation **5692**. Operation **5692** performs throttling the equipment usage item of the user resource based upon the device operating schedule. Arrow **5694** directs execution from operation **5692** to operation **5676**. Operation **5676** terminates the operations of this flowchart.

Figure **23A** depicts a detail flowchart of operation **5042** of Figure **4** for managing the market position portfolio.

Arrow **5710** directs the flow of execution from starting operation **5042** to operation **5712**. Operation **5712** performs maintaining a market window. Arrow **5714** directs execution from operation **5712** to operation **5716**. Operation **5716** terminates the operations of this flowchart.

Arrow **5720** directs the flow of execution from starting operation **5042** to operation **5722**. Operation **5722** performs maintaining a local market position portfolio comprised of at least one market position summary. Arrow **5724** directs execution from operation **5722** to operation **5716**. Operation **5716** terminates the operations of this flowchart.

Each of the market position summaries includes a market interval of the fungible, ephemeral commodity within the market window.

Arrow **5730** directs the flow of execution from starting operation **5042** to operation **5732**. Operation **5732** performs presenting the local market position portfolio based upon the market window. Arrow **5734** directs execution from operation **5732** to operation **5716**. Operation **5716** terminates the operations of this flowchart.

Figure **23B** depicts a detail flowchart of operation **5732** of Figure **23A** for presenting the local market position portfolio.

Arrow **5750** directs the flow of execution from starting operation **5732** to operation **5752**. Operation **5752** performs presenting at least one of the market position summaries including the market interval within the market

window. Arrow **5754** directs execution from operation **5752** to operation **5756**. Operation **5756** terminates the operations of this flowchart.

Note that at least one of the market position summaries of the local market position portfolio may include an amount-held, a current bid summary, a current ask summary, a current market price and a current order summary.

Figure **24** depicts a detail flowchart of operation **5752** of Figure **23B** for presenting the market position summary.

Arrow **5770** directs the flow of execution from starting operation **5752** to operation **5772**. Operation **5772** performs presenting the included market interval. Arrow **5774** directs execution from operation **5772** to operation **5776**. Operation **5776** terminates the operations of this flowchart.

Arrow **5780** directs the flow of execution from starting operation **5752** to operation **5782**. Operation **5782** performs presenting the amount-held. Arrow **5784** directs execution from operation **5782** to operation **5776**. Operation **5776** terminates the operations of this flowchart.

Arrow **5790** directs the flow of execution from starting operation **5752** to operation **5792**. Operation **5792** performs presenting the current bid summary. Arrow **5794** directs execution from operation **5792** to operation **5776**. Operation **5776** terminates the operations of this flowchart.

Arrow **5800** directs the flow of execution from starting operation **5752** to operation **5802**. Operation **5802** performs presenting the current ask summary. Arrow **5804** directs execution from operation **5802** to operation **5776**. Operation **5776** terminates the operations of this flowchart.

Arrow **5810** directs the flow of execution from starting operation **5752** to operation **5812**. Operation **5812** performs presenting the current market price. Arrow **5814** directs execution from operation **5812** to operation **5776**. Operation **5776** terminates the operations of this flowchart.

Arrow **5820** directs the flow of execution from starting operation **5752** to operation **5822**. Operation **5822** performs presenting the current order summary. Arrow **5824** directs execution from operation **5822** to operation **5776**. Operation **5776** terminates the operations of this flowchart.

Figure **25A** depicts a detail flowchart of operation **5000** of Figure **4** for the method of using the transaction system.

Arrow **5830** directs the flow of execution from starting operation **5000** to operation **5832**. Operation **5832** performs maintaining a market position database. Arrow **5834** directs execution from operation **5832** to operation **5836**. Operation **5836** terminates the operations of this flowchart.

Figure **25B** depicts a detail flowchart of operation **5832** of Figure **25A** for maintaining the market position database.

Arrow **5850** directs the flow of execution from starting operation **5832** to operation **5852**. Operation **5852** performs maintaining at least one market position containing at least one of the market intervals. Arrow **5854** directs execution from operation **5852** to operation **5856**. Operation **5856** terminates the operations of this flowchart.

Figure **26** depicts a detail flowchart of operation **5852** of Figure **25B** for maintaining the market position.

Arrow **5860** directs the flow of execution from starting operation **5852** to operation **5862**. Operation **5862** performs maintaining an amount-held associated with the market interval. Arrow **5864** directs execution from operation **5862** to operation **5866**. Operation **5866** terminates the operations of this flowchart.

Arrow **5870** directs the flow of execution from starting operation **5852** to operation **5872**. Operation **5872** performs maintaining a current bid list associated with the market interval including at least one current bid associated with the market interval. Arrow **5874** directs execution from operation **5872** to operation **5866**. Operation **5866** terminates the operations of this flowchart.

Arrow **5880** directs the flow of execution from starting operation **5852** to operation **5882**. Operation **5882** performs maintaining a current ask list associated with the market interval including at least one ask associated with the market interval. Arrow **5884** directs execution from operation **5882** to operation **5866**. Operation **5866** terminates the operations of this flowchart.

Arrow **5890** directs the flow of execution from starting operation **5852** to operation **5892**. Operation **5892** performs maintaining a current market price associated with the market interval. Arrow **5894** directs execution from operation **5892** to operation **5866**. Operation **5866** terminates the operations of this flowchart.

Arrow **5900** directs the flow of execution from starting operation **5852** to operation **5902**. Operation **5902** performs maintaining a current order list associated with the market interval. Arrow **5904** directs execution from

operation **5902** to operation **5866**. Operation **5866** terminates the operations of this flowchart.

Certain embodiments of the invention support at least one of the operations of Figure **26**.

Note that at least one of the market intervals contains an AC power transfer product type as the fungible, ephemeral commodity and contains the location as a first of the nodes directed to a second of the nodes of the AC power network node collection.

Figure **27A** depicts a detail flowchart of operation **5042** of Figure **4** for maintaining the local market position portfolio.

Arrow **5910** directs the flow of execution from starting operation **5042** to operation **5912**. Operation **5912** performs calculating the current bid summary from the market position database based upon the business location. Arrow **5914** directs execution from operation **5912** to operation **5916**. Operation **5916** terminates the operations of this flowchart.

Arrow **5920** directs the flow of execution from starting operation **5042** to operation **5922**. Operation **5922** performs calculating the current ask summary from the market position database based upon the business location. Arrow **5924** directs execution from operation **5922** to operation **5916**. Operation **5916** terminates the operations of this flowchart.

Arrow **5930** directs the flow of execution from starting operation **5042** to operation **5932**. Operation **5932** performs calculating the current market price from the market position database based upon the business location. Arrow

5934 directs execution from operation **5932** to operation **5916**. Operation **5916** terminates the operations of this flowchart.

Figure **27B** depicts a detail flowchart of operation **5000** of Figure **2A-2E** for the method of using the transaction system.

Arrow **5940** directs the flow of execution from starting operation **5000** to operation **5942**. Operation **5942** performs establishing a client node belonging to the node collection of the AC power network as the business location. Arrow **5944** directs execution from operation **5942** to operation **5946**. Operation **5946** terminates the operations of this flowchart.

Note that the operations of Figure **27A** may each be further based upon the flowgate collection.

The market interval may contain the AC power transfer product type as the fungible, ephemeral commodity and further, the market interval may contain an AC power transfer point-to-point product type as the fungible, ephemeral commodity.

Figure **28A** depicts a detail flowchart of operation **5000** of Figure **2A-2E** for the method of using the transaction system.

Arrow **5950** directs the flow of execution from starting operation **5000** to operation **5952**. Operation **5952** performs maintaining a flowgate collection containing at least two flowgate entries. Arrow **5954** directs execution from operation **5952** to operation **5956**. Operation **5956** terminates the operations of this flowchart.

Each flowgate entry contained in the flowgate collection may include a factor, a from-node of the node collection and a to-node of the node collection.

For each of the flowgate entries contained in the flowgate collection, at least one of the market intervals contains the AC power transfer product type as the fungible, ephemeral commodity and the location coinciding with the flowgate entry.

Note that as new transmission resources become available, the flowgate collection may be altered. Note also that if transmission resources become damaged, as for instance may result from a hurricane, the flowgate collection may also be altered.

Figure **28B** depicts a detail flowchart of operation **5872** of Figure **26** for maintaining the current bid list.

Arrow **5970** directs the flow of execution from starting operation **5872** to operation **5972**. Operation **5972** performs receiving a request for a point-to-point bid associated with the market interval to create a received point-to-point bid request. Arrow **5974** directs execution from operation **5972** to operation **5976**. Operation **5976** terminates the operations of this flowchart.

Arrow **5980** directs the flow of execution from starting operation **5872** to operation **5982**. Operation **5982** performs generating a point-to-point bid associated with the market interval based upon the received bid request to create a new point-to-point bid associated with the market interval. Arrow **5984** directs execution from operation **5982** to operation **5976**. Operation **5976** terminates the operations of this flowchart.

Note that certified client market makers **1440** may actively use the operations of Figure **28B**.

Figure **29** depicts a detail flowchart of operation **5032** of Figure **4** for managing the bilateral trading portfolio.

Arrow **8010** directs the flow of execution from starting operation **5032** to operation **8012**. Operation **8012** performs receiving an authenticated bilateral trade notification message to create a received bilateral trade notification message. Arrow **8014** directs execution from operation **8012** to operation **8016**. Operation **8016** terminates the operations of this flowchart.

Arrow **8020** directs the flow of execution from starting operation **5032** to operation **8022**. Operation **8022** performs updating the bilateral trading portfolio based upon the received bilateral trade notification message. Arrow **8024** directs execution from operation **8022** to operation **8016**. Operation **8016** terminates the operations of this flowchart.

Arrow **8030** directs the flow of execution from starting operation **5032** to operation **8032**. Operation **8032** performs generating an initial bilateral trade. Arrow **8034** directs execution from operation **8032** to operation **8016**. Operation **8016** terminates the operations of this flowchart.

Arrow **8040** directs the flow of execution from starting operation **5032** to operation **8042**. Operation **8042** performs processing the initial bilateral trade to create an initial bilateral trade message. Arrow **8044** directs execution from operation **8042** to operation **8016**. Operation **8016** terminates the operations of this flowchart.

Arrow **8050** directs the flow of execution from starting operation **5032** to operation **8052**. Operation **8052** performs inserting the initial bilateral trade into the bilateral trading portfolio. Arrow **8054** directs execution from operation **8052** to operation **8016**. Operation **8016** terminates the operations of this flowchart.

Arrow **8060** directs the flow of execution from starting operation **5032** to operation **8062**. Operation **8062** performs sending the initial bilateral trade message. Arrow **8064** directs execution from operation **8062** to operation **8016**. Operation **8016** terminates the operations of this flowchart.

Arrow **8070** directs the flow of execution from starting operation **5032** to operation **8072**. Operation **8072** performs receiving a bilateral trade confirmation message to create a received bilateral trade confirmation request. Arrow **8074** directs execution from operation **8072** to operation **8016**. Operation **8016** terminates the operations of this flowchart.

Arrow **8080** directs the flow of execution from starting operation **5032** to operation **8082**. Operation **8082** performs inserting the received bilateral trade confirmation request into the bilateral trading portfolio. Arrow **8084** directs execution from operation **8082** to operation **8016**. Operation **8016** terminates the operations of this flowchart.

Figure **30A** depicts a detail flowchart of operation **5032** of Figure **4** for managing the bilateral trading portfolio.

Arrow **8110** directs the flow of execution from starting operation **5032** to operation **8112**. Operation **8112** performs responding to the received bilateral trade confirmation request to create a bilateral trade confirmation response.

Arrow **8114** directs execution from operation **8112** to operation **8116**. Operation **8116** terminates the operations of this flowchart.

Arrow **8120** directs the flow of execution from starting operation **5032** to operation **8122**. Operation **8122** performs inserting the bilateral trade confirmation response into the bilateral trading portfolio. Arrow **8124** directs execution from operation **8122** to operation **8116**. Operation **8116** terminates the operations of this flowchart.

Arrow **8130** directs the flow of execution from starting operation **5032** to operation **8132**. Operation **8132** performs processing the bilateral trade confirmation response to create a bilateral trade confirmation response message. Arrow **8134** directs execution from operation **8132** to operation **8116**. Operation **8116** terminates the operations of this flowchart.

Arrow **8140** directs the flow of execution from starting operation **5032** to operation **8142**. Operation **8142** performs sending the bilateral trade confirmation response message. Arrow **8144** directs execution from operation **8142** to operation **8116**. Operation **8116** terminates the operations of this flowchart.

Figure **30B** depicts a detail flowchart of operation **5062** of Figure **4** for managing the credit resource collection, for each of the credit resources of the credit resource collection.

Arrow **8150** directs the flow of execution from starting operation **5062** to operation **8152**. Operation **8152** performs managing the credit resource. Arrow **8154** directs execution from operation **8152** to operation **8156**. Operation **8156** terminates the operations of this flowchart.

Figure **31** depicts a detail flowchart of operation **8152** of Figure **30B** for managing the credit resource, for at least one of the credit resources of the credit resource collection.

Arrow **8160** directs the flow of execution from starting operation **8152** to operation **8162**. Operation **8162** performs receiving a credit resource message to create a received credit resource message. Arrow **8164** directs execution from operation **8162** to operation **8166**. Operation **8166** terminates the operations of this flowchart.

Arrow **8170** directs the flow of execution from starting operation **8152** to operation **8172**. Operation **8172** performs updating the credit resource based upon the received credit resource message. Arrow **8174** directs execution from operation **8172** to operation **8166**. Operation **8166** terminates the operations of this flowchart.

Arrow **8180** directs the flow of execution from starting operation **8152** to operation **8182**. Operation **8182** performs presenting the credit resource. Arrow **8184** directs execution from operation **8182** to operation **8166**. Operation **8166** terminates the operations of this flowchart.

Arrow **8190** directs the flow of execution from starting operation **8152** to operation **8192**. Operation **8192** performs preparing a credit resource request message. Arrow **8194** directs execution from operation **8192** to operation **8166**. Operation **8166** terminates the operations of this flowchart.

Arrow **8200** directs the flow of execution from starting operation **8152** to operation **8202**. Operation **8202** performs sending the credit resource request message to create a sent credit request. Arrow **8204** directs execution from

operation **8202** to operation **8166**. Operation **8166** terminates the operations of this flowchart.

Note that one or more of the operations of Figure **31** may act as refinements of one or more of the operations of Figure **5B** and/or act as a refinement of operation **5212** of Figure **5A**.

Figure **32A** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource.

Arrow **8230** directs the flow of execution from starting operation **5022** to operation **8232**. Operation **8232** performs receiving a user resource schedule including a time interval to create a received schedule for the time interval. Arrow **8234** directs execution from operation **8232** to operation **8236**. Operation **8236** terminates the operations of this flowchart.

Arrow **8240** directs the flow of execution from starting operation **5022** to operation **8242**. Operation **8242** performs updating an operating schedule for the user resource based upon the received schedule for the time interval to create the operating schedule containing an operating schedule entry for the time interval. Arrow **8244** directs execution from operation **8242** to operation **8236**. Operation **8236** terminates the operations of this flowchart.

Arrow **8250** directs the flow of execution from starting operation **5022** to operation **8252**. Operation **8252** performs maintaining a real-time. Arrow **8254** directs execution from operation **8252** to operation **8236**. Operation **8236** terminates the operations of this flowchart.

Arrow **8260** directs the flow of execution from starting operation **5022** to operation **8262**. Operation **8262** performs controlling the user resource based upon the operating schedule for the user resource and based upon the real-time. Arrow **8264** directs execution from operation **8262** to operation **8236**. Operation **8236** terminates the operations of this flowchart.

Note that a market trading system component and a scheduling system component within the transaction system may use the same real-time clocking scheme, or separate and distinct real-time clocking schemes. This will effect operating the equipment usage item **5592**, maintaining the market window **5712**, by way of example. The market window preferably closes long enough before the real-time it refers to, so that all commitments are scheduled, and those schedules received by the certified client reliably. ###

The operating schedule entry for the time interval contained in the operating schedule for the user resource may include a capacity option item.

Figure **32B** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource.

Arrow **8290** directs the flow of execution from starting operation **5022** to operation **8292**. Operation **8292** performs sending a capacity option exercise message for the time interval based the capacity option item to create a sent capacity option exercise. Arrow **8294** directs execution from operation **8292** to operation **8296**. Operation **8296** terminates the operations of this flowchart.

Arrow **8300** directs the flow of execution from starting operation **5022** to operation **8302**. Operation **8302** performs updating the operating schedule entry for the time interval based upon the sent capacity option exercise.

Arrow **8304** directs execution from operation **8302** to operation **8296**. Operation **8296** terminates the operations of this flowchart.

Figure **33A** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource.

Arrow **8330** directs the flow of execution from starting operation **5022** to operation **8332**. Operation **8332** performs receiving a capacity exercise acknowledgment based upon the sent capacity option exercise to create a received capacity exercise acknowledgment. Arrow **8334** directs execution from operation **8332** to operation **8336**. Operation **8336** terminates the operations of this flowchart.

Arrow **8340** directs the flow of execution from starting operation **5022** to operation **8342**. Operation **8342** performs updating the operating schedule entry for the time interval based upon the received capacity exercise acknowledgment. Arrow **8344** directs execution from operation **8342** to operation **8336**. Operation **8336** terminates the operations of this flowchart.

In certain embodiments of the invention, a sent capacity option exercise includes an exercise amount and the received capacity exercise acknowledgment includes an acknowledgment amount.

Figure **33B** depicts a detail flowchart of operation **5022** of Figure **4** for managing the user resource.

Arrow **8370** directs the flow of execution from starting operation **5022** to operation **8372**. Operation **8372** performs determining if the exercise amount is greater than the acknowledgment amount. Arrow **8374** directs execution

from operation **8372** to operation **8376**. Operation **8376** terminates the operations of this flowchart.

Arrow **8380** directs the flow of execution from starting operation **5022** to operation **8382**. Operation **8382** performs reporting a shortfall of the exercise amount minus the acknowledgment amount whenever the exercise amount is greater than the acknowledgment amount. Arrow **8384** directs execution from operation **8382** to operation **8376**. Operation **8376** terminates the operations of this flowchart.

Note that a market trade may be associated with at least one of said market intervals of said fungible, ephemeral commodity by said certified client with a member of the trade specification collection.

A trade specification collection may include a bid specification, an ask specification and a commitment specification. Each of these specifications may include an amount and price.

Additionally any of these specifications may refer to a capacity option which would include at least an exercise price.

A commitment specification may further include references to one or more other certified clients participating in the commitment.

Figure **34A** depicts a detail flowchart of operation **5052** of Figure **4** for managing said market trade collection.

Arrow **8410** directs the flow of execution from starting operation **5052** to operation **8412**. Operation **8412** performs presenting said market trade, for at least one of said market trades. Arrow **8414** directs execution from operation

8412 to operation **8416**. Operation **8416** terminates the operations of this flowchart.

Figure **34B** depicts a detail flowchart of operation **8412** of Figure **34A** for presenting said market trade, for at least one of said market trades.

Arrow **8450** directs the flow of execution from starting operation **8412** to operation **8452**. Operation **8452** performs presenting said market interval. Arrow **8454** directs execution from operation **8452** to operation **8456**. Operation **8456** terminates the operations of this flowchart.

Arrow **8460** directs the flow of execution from starting operation **8412** to operation **8462**. Operation **8462** performs identifying said member of said trade specification collection. Arrow **8464** directs execution from operation **8462** to operation **8456**. Operation **8456** terminates the operations of this flowchart.

Note that identifying the trade specification collection member may be achieved by at least any of the following: a visual token or icon located near the presentation of the trade; a columnar region in which all the market trades for that specification member are listed; and a color coding of a market trade based upon the specification collection membership.

Arrow **8470** directs the flow of execution from starting operation **8412** to operation **8472**. Operation **8472** performs presenting said amount. Arrow **8474** directs execution from operation **8472** to operation **8456**. Operation **8456** terminates the operations of this flowchart.

Arrow **8480** directs the flow of execution from starting operation **8412** to operation **8482**. Operation **8482** performs presenting said price. Arrow **8484** directs execution from operation **8482** to operation **8456**. Operation **8456** terminates the operations of this flowchart.

Note that as used herein, presentation of a market trade to a certified client, who is a software agent, may include the operations of Figure **34B** asserting facts to the software agent.

In many circumstances, the identification of other certified clients involved in at least the commitment trades can be expected, even though this may not always be the case.

Consider a collective trading situation of a group of small facility operators pooling their resources to trade in a general market such as the virtual trading floor. Such small operators may be unable to individually participate in the general market, due to minimum lot size constraints. In such situations, the individual certified client may not be informed of other trading certified clients, just of the open bids and asks as well as commitments within their collective group.

The preceding embodiments of the invention have been provided by way of example and are not meant to constrain the scope of the following Claims.